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**B.Sc. I (Semester – I) Examination, 2017
ENGLISH (Compulsory) (CBCS Pattern) (New)
'On Track' English Skills for Success**

Time : 2.30 Hours

Total Marks : 70

N.B. : 1) **All questions are compulsory.**
2) **Figures to the right indicate full marks.**

1. Complete the following statements by choosing the correct alternatives from those given below them.

14

- 1) Jimmy and Bob dined at _____ restaurant twenty years ago.
 - a) Big Brother's
 - b) Big Boss Brandy's
 - c) Big Joe' Brady's
 - d) John Bradly's
- 2) The story, 'After Twenty Years' implies that 'silky' Bob is _____.
 - a) Private Detector
 - b) Restaurant Owner
 - c) Police Officer
 - d) Gangster or Criminal
- 3) The writer met Miss. Krishna _____.
 - a) at an art exhibition
 - b) at the hotel
 - c) in railway
 - d) in city bus
- 4) The narrator of the story 'The Connoisseur' is _____.
 - a) Nergis Dalal
 - b) Sarojini Naidu
 - c) O. Henry
 - d) Attila Narin
- 5) The essential part of intelligence, as the Latin word suggests, is _____.
 - a) the inability to neglect the simple facts
 - b) the ability to look beyond the simple the facts
 - c) the inability to look at nature
 - d) the ability to compete others
- 6) Mr. Binet developed _____.
 - a) IQ Test
 - b) GK Test
 - c) Aptitude Test
 - d) Computer software



3. A) Write short answers on **any two** of the following : 8
- 1) Describe the different types of bangles which the bangle sellers carry.
 - 2) What is the theme of 'An Irish Airman Foresees His Death' ?
 - 3) The speaker in 'An Irish Airman Foresees His Death'.

- B) Write a paragraph on **any two** of the following : 6
- 1) Human values are Timeless and Eternal.
 - 2) Solar Energy.
 - 3) A Decision that Changed my life.

4. Write an essay on the impact of mobile on the lives of young people in the present day. 14

OR

Write an essay describing an exciting cricket match which you have seen.

5. Read the following passage and make notes of it. Use an appropriate title for your notes. 14

Drugs related health disorders are many and varied. Dirty needles and solutions used for injecting drugs can easily cause abscesses in the arms and veins, liver disease, venereal diseases and infection of the kidneys and brain. Sniffing cocaine and amphetamines can damage the tissue of the nose and Marijuana and tobacco smoking can cause lung diseases. Heavy users of alcohol, volatile solvents, amphetamines or Marijuana may find that their livers are permanently damaged. Babies of women addicted to opiates are likely to be born addicted and to suffer from withdrawal symptoms. Cocaine and amphetamines can cause hair loss. Recent research has indicated that Marijuana can damage cells. A drug user's way of life makes him more susceptible to pneumonia, tuberculosis, malnutrition and weight loss. Finally, an overdose of any of the sensual drugs can lead to respiratory or cardiac failure and death.



Seat No.	
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B.Sc. (Part – I) (Semester – I) Examination, 2017
CHEMISTRY (Paper – I) (CBCS Pattern) (New)
Physical Chemistry

Time : 2 ½ Hours

Total Marks : 70

- Instructions:** 1) **All** questions are **compulsory**.
2) Draw **neat** diagram and give equations **wherever** necessary.
3) Figures to the **right** indicate **full** marks.
4) **Use** of logarithmic tables and scientific calculator is **allowed**. (At.wts. H = 1, C = 12, O = 16, N = 14, Na = 23 and Cl = 35.5)

1. Select the correct alternative for **each** of the following : **14**
- 1) The order of a reaction in which rate constant and half life period are inversely proportional to the concentration is
a) First b) Zero c) Second d) Third
 - 2) Hot reservoir represents
a) Source b) Sink
c) Isolated System d) Open System
 - 3) Integration of dx is _____
a) X b) X + C c) log x d) log x + C
 - 4) P_c , V_c and T_c are know as _____
a) gas constants b) critical constants
c) van der Waals' constants d) velocity constants
 - 5) The rate of reaction _____ with increase in temperature.
a) Decrease b) Increase
c) Remain constant d) All of these
 - 6) The symbol \int represents _____
a) Integration b) Derivative c) Both of these d) None of these



- 7) If one of the reactant in bimolecular reaction is present in large excess, the reaction becomes kinetically of _____ order.
a) First b) Zero c) Second d) Third
- 8) The ideal gas equation for n mole of gas is _____
a) $PV=RT$ b) $PV = nRV$ c) $PV = nRT$ d) $PV = T/RT$
- 9) In adiabatic process
a) $q = 0$ b) $q = 1$ c) $w = q$ d) $q \neq 0$
- 10) No machine has _____ efficiency.
a) 0% b) 80% c) 100% d) 70%
- 11) The reaction in which molecularity and order of reaction are not equal is known as _____ reaction.
a) Zero order b) Pseudo-molecular
c) Second order d) First order
- 12) The point of intersection of X and Y axis in the graph is known as _____
a) Slope b) Origin c) Intercept d) All of these
- 13) The number of molecules taking part in chemical reaction is known as _____
a) Order of reaction b) Molecularity of reaction
c) Specific reaction rate d) Rate of reaction
- 14) The rate constant in first order reaction is 0.0154 Min^{-1} . The half life period of the reaction is _____
a) 60 min b) 45 min c) 120 min d) 20 min

2. Answer **any seven** of the following :

14

- i) Give any four rules of derivative.
- ii) $K = \frac{2.303}{t} \log \frac{a}{a-x}$ using this equation plot a graph of $\log \frac{a}{a-x}$ against t.
Find the value of slope.
- iii) Distinguish between definite integral and indefinite integral.
- iv) Define the term order of chemical reaction.
- v) Define ideal and non-ideal gases.



- vi) What is isotherm ?
- vii) Give any two statement of second law of thermodynamics.
- viii) What is heat engine ? Give example.
- ix) Define graph and graph paper.

3. A) Answer **any two** of the following : 10

- i) Explain Joule Thomson effect.
 - ii) What is slope ? Give its characteristics.
 - iii) Explain efficiency of heat engine on the basis of Carnot cycle. Calculate the % efficiency of stem engine operating between 373 K. and 298 K.
- B) For a certain first order reaction the time for half change is 72 min. How much time will be required for the completion of 90% reaction. 4

4. Answer **any two** of the following : 14

- i) Define first order reaction and derive the rate constant equation for first order reaction.
- ii) Define rate of reaction. Discuss different factor which affect the rate of reaction.
- iii) What are the causes for deviation of gases from ideal behavior ? Calculate the critical constant of a gas from the following data :

$$a = 1.406 \text{ Nm}^4 \text{ mol}^{-2}$$

$$b = 9.94 \times 10^{-5} \text{ m}^3$$

$$R = 8.31 \text{ JK}^{-1}.$$

5. Answer **any two** of the following : 14

- i) Mention various method used for determination of the order of reaction. Describe any two of them.
 - ii) What correction is made by van der Waals in the postulates of kinetic theory of gases ? How he deduce a new equation in the light of these ?
 - iii) Define second order reaction. Derive the expression for the velocity constant of the second order reaction where initial concentrations of the reactants are same.
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B.Sc. (Part – I) (Semester – I) Examination, 2017
CHEMISTRY (Paper – II) (New CBCS Pattern)
Inorganic Chemistry

Time : 2 ½ Hours

Max. Marks : 70

- Instructions :** 1) **All** questions are **compulsory**.
2) **All** questions carry **equal** marks.
3) Figures to the **right** indicate **full** marks.
4) **Neat** and labeled diagrams should be drawn **wherever** possible.

1. Select the most correct alternative for **each** of the following and rewrite the sentence.

14

- i) Possible values of spin quantum number are
a) 0 and 1 b) 1 and 2 c) + ½ and – ½ d) ½ and 0
- ii) All the d-orbitals have equal energy, therefore they are called _____ orbitals.
a) quantized b) degenerate c) unsymmetrical d) coplanar
- iii) The electronic configuration of Phosphorous (P) is
a) [Ar] 3d¹⁰ 4s² 4p³ b) [Kr] 3d¹⁰ 4s² 4p³
c) [Ne] 3s² 3p³ d) [Ar] 4s² 4p³
- iv) The strength of covalent bond depends upon
a) number of electron
b) the extent of overlapping of atomic orbitals
c) type of orbitals
d) type of hybridization
- v) The crystal structure of NaCl is
a) BCC b) cubic c) FCC d) Hexagonal
- vi) Critical radius ratio at contact position for CN = 6 is
a) 0.155 b) 0.225 c) 0.732 d) 0.414

P.T.O.



- vii) In H_2O molecule, _____ hybridization is present.
a) sp b) sp^2 c) sp^3 d) $sp^3 d$
- viii) The shape of PCl_5 molecule is
a) linear b) octahedral
c) tetrahedral d) trigonal bipyramidal
- ix) For H_2 molecule, $\Delta E =$ _____ kJ/mole.
a) 432 b) 532 c) 342 d) 352
- x) In BeCl_2 molecule, the bond angle is
a) 90° b) 180° c) 72° d) 120°
- xi) The bond length in NO molecule is _____ Å.
a) 1.44 b) 1.06 c) 1.18 d) 1.81
- xii) Oxygen molecule contains _____ unpaired electrons.
a) two b) three c) one d) zero
- xiii) MOT is discussed on the basis of
a) Aufbau process b) LCAO approximation
c) Pauli's exclusion principle d) Pearson's principle
- xiv) The bond order of Li_2 molecule is
a) 1.5 b) 2.0 c) 2.5 d) 1.0

2. Answer **any seven** of the following :

14

- i) Draw the shape of p – orbitals.
- ii) Why inert gas elements have zero electron affinity ?
- iii) Give the steps involved in hybridization of atomic orbitals.
- iv) In water molecule, bond angle decreases from $109^\circ 28'$ to $104^\circ 27'$, why ?
- v) AlCl_3 is less ionic than AlBr_3 , why ?
- vi) What is stoichiometry ?



- vii) Give the importance of Born-Haber cycle.
- viii) What is an energy level sequence of molecular orbitals for $n = 2$?
- ix) Give the characteristics of non-bonding molecular orbitals.
3. A) Write note on **any two** of the following : **10**
- i) Shapes of d-orbitals.
 - ii) Formation of ClF_3 molecule.
 - iii) Bond order and stability of molecule.
- B) What is radius ratio ? Calculate radius ratio for octahedral geometry. **4**
4. Answer **any two** of the following : **14**
- i) What is chemical bond ? Discuss the types of chemical bonds.
 - ii) Give a brief account on valence bond theory.
 - iii) Give the comparison between atomic orbitals and molecular orbitals.
5. Answer **any two** of the following : **14**
- i) What is MO diagram ? With the help of MO diagram explain the formation and characteristics of CO molecule.
 - ii) Discuss the formation of SiCl_4 molecule.
 - iii) What is ionic bond ? Explain the formation of ionic bond with example.
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B.Sc. (Part – I) (Semester – I) (New) (CBCS) Examination, 2017
PHYSICS (Paper – I)
Mechanics and Properties of Matter

Time : 2¹/₂ Hours

Max. Marks : 70

- N.B. :** 1) **All questions are compulsory.**
2) Figures to the **right** indicate **full** marks.
3) **Draw neat diagrams wherever necessary.**
4) **Use of logarithmic tables or calculator is allowed.**
Given data : Acceleration due to **gravity, $g = 980\text{cm/s}^2$.**

1. Select the correct alternative from the following : 14
- i) Moment of inertia of a disc about its diameter is given by _____
- a) $\frac{MR^2}{2}$ b) MR^2 c) $\frac{MR^2}{4}$ d) $\frac{2}{3}MR^2$
- ii) With the increase in temperature, surface tension _____
- a) Increases b) Decreases
c) Does not change d) Either decrease or increase
- iii) Potential energy possessed by unit mass of a liquid flowing at a height of 20m is _____
- a) 2.04 J b) 20 J c) 196 J d) 0.49 J
- iv) The length of the equivalent simple pendulum is also called as _____ of the compound pendulum.
- a) Equal length b) Reduced length
c) Extended length d) Suspension length



- v) If T is the surface tension of a liquid then the excess pressure inside the liquid drop of radius r is _____
- a) $\frac{2T}{r}$ b) $\frac{4T}{r}$ c) $\frac{T}{4r}$ d) $\frac{T}{2r}$
- vi) Torsional pendulum is used to determine _____ of the material.
- a) Young's modulus b) Density
c) Mass d) Modulus of rigidity
- vii) The theoretical upper limiting value of Poisson's ratio is _____
- a) -1 b) $+1.5$ c) $+0.5$ d) -0.5
- viii) Dimensions of moment of inertia are _____
- a) $[M^1 L^{-2} T^0]$ b) $[M^2 L^2 T^0]$
c) $[M^1 L^1 T^2]$ d) $[M^1 L^2 T^0]$
- ix) Venturimeter is used mainly to determine the _____
- a) Density of liquid
b) Rate of flow of water through a pipe
c) Viscosity of water through the capillary
d) Pressure of a liquid
- x) If the substance is highly soluble in a liquid then the surface tension of the liquid _____
- a) Increases b) Decreases
c) Does not change d) None of these
- xi) _____ indicates the resistance of elastic solid to elongation.
- a) Elastic limit b) Modulus of rigidity
c) Young's modulus d) Bulk modulus
- xii) Moment of inertia in rotational motion is analogous to the _____ in translational motion.
- a) Mass b) Force
c) Acceleration d) Velocity



4. Attempt **any two** of the following : **14**
- 1) Derive the relation between surface tension, excess pressure and radius of curvature.
 - 2) Obtain an expression for moment of inertia of a flywheel.
 - 3) Calculate modulus of rigidity of a material for which $K = 9.6 \times 10^{10} \text{ N/m}^2$ and $Y = 12.5 \times 10^{10} \text{ N/m}^2$. Also, in this case calculate tensile stress if the tensile strain is 0.2.
5. Attempt **any one** of the following :
- 1) What is a bifilar pendulum ? Derive an expression for the period of a bifilar pendulum. **10**
Calculate radius of gyration of a bar pendulum whose minimum time period of oscillation is 1.55 sec. **4**
 - 2) Obtain Poiseuille's equation to determine the coefficient of viscosity of a liquid. **10**
Water flows at a rate of 20 cc per second, through a horizontal capillary of 30 cm and diameter 0.2 cm. If the coefficient of viscosity is 0.015 poise calculate the pressure to maintain the flow. **4**
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B.Sc. I (Semester – I) (New) (CBCS) Examination, 2017
PHYSICS (Paper – II)
Optics and Laser

Time : 2½ Hours

Max. Marks : 70

- Instructions :** 1) **All questions are compulsory.**
2) **Figures to the right indicate full marks.**
3) **Draw neat diagrams wherever necessary.**
4) **Use of calculator and log tables is allowed.**

1. Select the correct alternative :

14

- i) If diameter of circle of least confusion is 6 cm then lateral or transverse spherical aberration of the lens is _____ cm.
a) 2 b) 3 c) 4 d) 12
- ii) The blurring of image due to the difference in focal lengths of different colors is called _____ aberration.
a) lateral b) axial c) spherical d) chromatic
- iii) The condition for achromatism of two thin lenses placed in contact is _____
a) $\frac{\omega}{f} = -\frac{\omega'}{f'}$ b) $\frac{\omega}{f} = \frac{\omega'}{f'}$ c) $\omega f = -\omega' f'$ d) $\omega f = \omega' f'$
- iv) Cross-wires cannot be used with _____ eye-piece.
a) Huygen's b) Ramsden's c) Gauss d) None of these
- v) Gauss eyepiece is modification of _____ eyepiece.
a) Newton's b) Huygen's c) Ramsdens d) Kellner's
- vi) When a ray of light gets reflected from the surface of a denser medium, then additional path difference introduced is _____
a) 2λ b) $\frac{\lambda}{2}$ c) $\frac{\lambda}{4}$ d) λ
- vii) The fringes obtained in case of Newton's rings experiment are _____
a) localized fringes b) of equal thickness
c) localized and of equal thickness d) delocalized fringes

P.T.O.



- viii) In case of Newton's rings experiment if the ring pattern is formed due to reflected light then the centre of ring pattern is _____
a) dark b) bright c) dark or bright d) semi-dark
- ix) The phenomenon of diffraction is explained on the basis of _____
a) Fermat's principle
b) Rectilinear propagation of light
c) Newton's corpuscular theory
d) Huygen's theory of secondary wavelets
- x) In plane diffraction grating, if 'a' and 'b' are width of slit and width of the opaque portion respectively then the grating element, $d =$ _____
a) $\frac{a}{b}$ b) $a \times b$ c) $a + b$ d) $a - b$
- xi) There are 15,000 lines per inch of a given grating, then its grating element $d =$ _____ cm.
a) 1.7×10^{-4} b) 1.1×10^{-4} c) 2.7×10^{-4} d) 3.1×10^{-4}
- xii) He-Ne laser is a _____ laser.
a) liquid b) gas c) solid d) semiconductor
- xiii) In Helium-Neon laser, the type of pumping used is _____
a) mechanical b) optical c) chemical d) electrical
- xiv) ' N_1 ' and ' N_2 ' be population of atoms in lower and higher energy states, when population inversion occurs _____
a) $N_1 < N_2$ b) $N_1 > N_2$ c) $N_1 = N_2$ d) $\frac{N_1}{2} = N_2$

2. Answer **any seven** of the following :

14

- i) State laws of refraction.
- ii) Give methods of minimize spherical aberration.
- iii) Draw diagram of Huygen's eyepiece.
- iv) Distinguish between Huygen's eyepiece and Ramsden's eyepiece.
- v) In a Newton's rings experiment, the diameters of 18th and 4th dark ring are 0.7 cm and 0.4 cm respectively. The radius of curvature of the plano convex lens is 100 cm. Calculate the wavelength of the monochromatic light used to obtain the fringes.



- vi) Give the comparison between prism and grating spectra.
- vii) What is population inversion ?
- viii) What are applications of LASER ?

3. A) Answer **any two** of the following : 10

- i) Using Fermat's principle show that angle of incidence is equal to angle of reflection. A ray of light enters from air to water. Calculate angle of refraction if angle of incidence is equal to 30° . (Given : $\mu_a = 1$ and $\mu_w = 1.33$).
- ii) Obtain equation for fringe width due to interference in thin wedge shaped film.
- iii) Explain the elementary theory of plane diffraction grating. Obtain the relation $d \sin \theta = n\lambda$ for principal maxima in the n^{th} order.

B) Write a note on Gauss eyepiece. 4

4. Solve **any two** of the following : 14

- i) Give construction of optical bench. Explain use of optical bench for any one application.
- ii) Obtain an expression for the optical path difference between two successively reflected rays of monochromatic light for a thin parallel faced film. Calculate an angle made by reflected light with the surface of a parallel faced thin film when an angle of incidence 'i = 30° '.
- iii) Describe construction and working of Ruby laser.

5. Solve **any one** of the following : 14

- i) Derive condition for achromatism of two thin lenses separated by finite distance. Two lenses of focal lengths 8 cm and 4 cm are placed at a certain distance apart. Calculate the distance between the lenses if they form an achromatic combination.
- ii) Describe the experiment to determine the wavelength of light by using a plane diffraction grating and a spectrometer.

With plane diffraction grating the angle of diffraction for the first order principal maxima is 30° . Calculate the wavelength of light incident on the grating if the grating element is 1.2×10^{-4} cm.



- vii) Mode is
- middle most value
 - most frequent value
 - can be formed when individual observation do not repeat
 - any maximum observation
- viii) In an individual series 25, 17, 9, 11, 5, 4, 13, 7 are eight observations, then median is
- 10
 - 12
 - 13
 - none of these
- ix) M.D. is minimum when the deviations are taken from
- Mean
 - Median
 - Mode
 - All the above
- x) The formula of semi-inter quartile range is
- $Q_3 - Q_1$
 - $\frac{Q_3 - Q_1}{2}$
 - $\frac{Q_3 - Q_1}{Q_3 + Q_1}$
 - $\frac{Q_1 - Q_3}{2}$
- xi) If a constant 10 is subtracted from each observation of a set, the variance is
- Decreased by 10
 - Decreased by 100
 - Increased by 10
 - Not changed
- xii) The first order moment about mean is
- Zero
 - One
 - Three
 - None of the above
- xiii) If first order movement about 5 is 2, then mean is equal to
- 5
 - 2
 - 7
 - None of these
- xiv) If the values of mean, mode and median are equal, then the curve is
- Positively skew
 - Negatively skew
 - Symmetric
 - None of these

2. Answer **any seven** of the following :

14

- Define frequency and cumulative frequency.
- Define class limits and mid-points.
- Define G.M. and H.M.



- iv) State any two properties of A.M.
 - v) Find A.M. and G.M. of two observation 4 and 9.
 - vi) Define range and coefficient of range.
 - vii) Define mean square deviation and state its minimal property.
 - viii) Show that second central moment is variance.
 - ix) Explain the term kurtosis.
3. A) Write short note on **any two** of the following : **10**
- i) Distinguish between inclusive method and exclusive method of class intervals.
 - ii) Show that mean square deviation is greater than or equal to variance.
 - iii) The first three moments of a distribution about 2 are 1, 22, 10. Find its mean, S.D. and 3rd central moment.
- B) What is the effect of change of origin and scale on arithmetic mean ? **4**
4. Answer **any two** of the following : **14**
- i) What is Histogram ? How it is constructed ? Explain how it is used to locate mode.
 - ii) Derive the formula of mode for grouped frequency distribution.
 - iii) A variable takes values 1, 2, 3, 4,.....n with frequencies 1, 2, 3, 4,.....n. Find its mean and variance.
5. Answer **any two** of the following : **14**
- i) Define arithmetic mean and show that sum of squares of deviations is minimum when calculated about mean.
 - ii) Define S.D. and M.D. Show that S.D. is always greater than or equal to M.D. about mean.
 - iii) What is skewness ? Explain different types of skewness. State the empirical relation between mean, median and mode.
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**B.Sc. – I (Semester – I) Examination, 2017
(CBCS Pattern) (New)
STATISTICS (Paper – II)
Probability and Probability Distributions – I**

Time : 2½ Hours

Max. Marks : 70

N.B. : 1) **All questions are compulsory.**
2) Figures to the **right** indicate **full** marks.

1. Choose the correct alternative : **14**
- i) A ticket is drawn from 25 tickets numbered 1 to 25. Define an event as : the number drawn is odd number. The number of elements in this event is
a) 11 b) 12 c) 13 d) 25
- ii) For a classical definition of probability the sample space must be
a) Discrete
b) Continuous
c) Finite with equiprobable sample space
d) None of these
- iii) A, B and C are mutually exclusive and exhaustive events, for which set the function $P(\cdot)$ is regarded as probability function
a) $P(A) = \frac{1}{2} P(B) = 0.5 P(C) = 0$ b) $P(A) = P(B) = P(C) = \frac{1}{4}$
c) $P(A) = P(B) = \frac{1}{2}, P(C) = \frac{1}{4}$ d) $P(A) = \frac{3}{4} P(B) = \frac{1}{2} P(C) = -\frac{1}{4}$
- iv) Two events are said to be independent if
a) Each outcome has equal chance of occurrence
b) They are disjoint
c) One does not affect the occurrence of the other
d) None of these



xiii) For the following distribution

X	:	0	1	2
P(x)	:	k	5k	4k

The value of k is

- a) 1
- b) $\frac{1}{2}$
- c) $\frac{1}{4}$
- d) $\frac{1}{10}$

xiv) If P(x) is p.m.f. of X. Then distribution function of $F_x(X)$ is given by

- a) $P(X < \infty)$
- b) $P(X \leq x)$
- c) $P(X \geq x)$
- d) $P(0 < X < 1)$

2. Answer **any seven** of the following :

14

- i) Define finite sample space and countably infinite sample space.
- ii) Define mutually exclusive events and exhaustive events.
- iii) For any events show that $P(A^c) = 1 - P(A)$.
- iv) What is the probability that a non-leap year will have 53 Sunday ?
- v) Define axiomatic definition of probability.
- vi) Define :
 - a) Pairwise independence of events A, B and C.
 - b) Mutual independence of events A, B and C.
- vii) If $A \subset B$ then prove that $P(B|A) = 1$.
- viii) Define :
 - i) Discrete random variable
 - ii) Probability mass function (p.m.f.)
- ix) If the p.m.f. of a discrete random variable X is
$$P(X = x) = C \quad x = 0, 1, 2, 3, 4$$
$$= 0 \text{ otherwise}$$

Find the value of C.



3. A) Write short note on **any two** of the following : 10
- i) If $P(A) = 0.2$, $P(B) = K$ and $P(A \cup B) = 0.6$.
Find K
 - a) If A and B are independent events
 - b) If A and B are mutually exclusive events.
 - ii) Define partition of the sample space. If A, B and C form the partition of sample space and if $3P(A) = 2P(B) = 6P(C)$ then find $P(A)$.
 - iii) If A, B, C are any three events defined on sample space Ω with $P(A) > 0$ then prove that $P(B \cup C/A) = P(B/A) + P(C/A) - P(B \cap C/A)$.
- B) State and prove addition law of probability for two events. 4
4. Answer **any two** of the following : 14
- i) A and B are two events defined on sample space Ω such that $P(A) = \frac{1}{4}$, $P(B) = \frac{1}{5}$ and $P(A \cap B) = \frac{1}{7}$.
Find :
 - i) $P(A \cap B)^c$
 - ii) $P(A^c \cup B^c)$
 - iii) $P(A \cap B^c)$
 - iv) $P(A \cup B)$
 - ii) State and prove Bayes theorem on probability.
 - iii) If A and B are independent events. Then prove that
 - i) A and B^c are independent
 - ii) A^c and B are independent.
5. Answer **any two** of the following : 14
- i) For any two events A and B prove that $P(A \cap B) \leq P(A) \leq P(A \cup B) \leq P(A) + P(B)$.
 - ii) A fair coin is tossed twice and the events are defined as follows
A : Head on first toss
B : Head on second toss
C : Same face on both tosses
Discuss pairwise and mutual independence of A, B and C.
 - iii) A r.v. X has the following probability distribution.

X	:	1	2	3	4	5	6	7
P(x)	:	1/8	2/8	3/8	1/64	9/64	2/64	4/64

 Find :
 - i) $P(2 < X < 6)$
 - ii) $P(X \geq 5)$
 - iii) Distribution function of X
 - iv) Median of X



2. Attempt **any seven** of the following :

14

1) If A is any square matrix then show that $A + A^T$ is a symmetric matrix.

2) Find the characteristic equation of matrix $\begin{bmatrix} 1 & 3 & 7 \\ 4 & 2 & 3 \\ 1 & 2 & 1 \end{bmatrix}$.

3) Test for consistency the equations

$$x + y + z = -3,$$

$$3x + y - 2z = -2,$$

$$2x + 4y + 7z = 7.$$

4) Find the rank of matrix $\begin{bmatrix} 1 & -3 & -8 \\ 3 & 1 & -4 \\ 2 & 5 & 6 \end{bmatrix}$.

5) Simplify $\frac{(\cos 2\theta + i \sin 2\theta)^7}{(\cos 4\theta + i \sin 4\theta)^3} \cdot \frac{(\cos 3\theta - i \sin 3\theta)^3}{(\cos 7\theta - i \sin 7\theta)}$.

6) Find all values of $(-1)^{1/4}$.

7) Separate the real and imaginary parts of $\cosh(x + iy)$.

8) Prove that $\cosh^2 z - \sinh^2 z = 1$.

3. A) Attempt **any two** of the following :

10

1) Solve $x + y + z = 0$

$$2x + 5y + 7z = 0$$

$$2x - 5y + 3z = 0$$

2) Reduce the matrix $A = \begin{bmatrix} 4 & 2 & 1 & 3 \\ 6 & 3 & 4 & 7 \\ 2 & 1 & 0 & 1 \end{bmatrix}$ to normal form and hence find the rank of matrix A.

3) Show that

$$[\sin(\alpha - \theta) + e^{i\alpha} \sin \theta]^n = \sin^n \alpha \cdot e^{in\theta}.$$

B) Find the eigen values and eigen vectors of the matrix $\begin{bmatrix} 3 & 2 \\ -1 & 0 \end{bmatrix}$.

4



4. Attempt **any two** of the following :

14

1) For what values of λ , the equations

$$x + y + z = 1$$

$$2x + y - 4z = \lambda$$

$4x + 5y + 10z = \lambda^2$ have a solution and solve them completely in each case.

2) Solve $x^6 + x^5 + x^4 + x^3 + x^2 + x + 1 = 0$.

3) If x real then show that

i) $\cosh^{-1}x = \log \left(x + \sqrt{x^2 - 1} \right)$

ii) $\sinh^{-1}x = \log \left(x + \sqrt{x^2 + 1} \right)$

5. Attempt **any one** of the following :

14

1) State and prove Cayley-Hamilton theorem and find the inverse of matrix

$$\begin{bmatrix} 1 & 2 & 1 \\ 0 & 1 & -1 \\ 3 & -1 & 1 \end{bmatrix} \text{ using Cayley-Hamilton inverse method.}$$

2) State and prove De-Moivre's Theorem and if α and β are the roots of the

equation $x^2 - 2x + 2 = 0$, then show that $\alpha^n + \beta^n = 2^{\frac{n+2}{2}} \cos\left(\frac{n\pi}{4}\right)$.



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B.Sc. – I (Semester – I) (CBCS Pattern) (New) Examination, 2017
MATHEMATICS (Paper – II)
Calculus

Time : 2½ Hours

Max. Marks : 70

N. B. : 1) All questions are compulsory.
2) Figures to the right indicate full marks.

1. Select and write the correct alternative for each of the following : 14

1) If $y = (2x + 3)^5$ then $y_3 =$ _____

a) $480(2x + 3)$ b) $480(2x + 3)^2$

c) $\frac{480}{2x + 3}$ d) none of these

2) If $y = x^7$ then $y_8 =$ _____

a) $7!$ b) $\frac{7!}{8!}x$ c) $8!x^2$ d) 0

3) $\lim_{x \rightarrow 0} \frac{3^x - 2^x}{x} =$ _____

a) 0 b) 1 c) $\log \frac{3}{2}$ d) $\log \frac{2}{3}$

4) The expansion of $\log(1 + x) =$ _____

a) $x - \frac{x^2}{2} + \frac{x^3}{3} - \frac{x^4}{4} + \dots$ b) $-x - \frac{x^2}{2} - \frac{x^3}{3} + \dots$

c) $x + \frac{x^2}{2} + \frac{x^3}{3} + \dots$ d) none of these

5) If $u = \frac{y}{z} + \frac{z}{x} + \frac{x}{y}$ then $x \frac{\partial u}{\partial x} + y \frac{\partial u}{\partial y} + z \frac{\partial u}{\partial z} =$ _____

a) u b) $2u$ c) $-u$ d) 0



6) If $u = \log \left\{ \frac{x^5 + y^5}{x^3 + y^3} \right\}$ then $x \frac{\partial u}{\partial x} + y \frac{\partial u}{\partial y} =$ _____

- a) e^u b) $2e^u$ c) $2u$ d) 2

7) If $u = x^3 - 3xy^2$, $v = 3x^2y - y^3$ then $\frac{\partial u}{\partial x} - \frac{\partial v}{\partial y} =$ _____

- a) 0 b) 1 c) x d) $x^2 - y^2$

8) If $u = x^3 + y^3$, where $x = a \cos \theta$, $y = b \sin \theta$ then $\frac{\partial u}{\partial \theta} =$ _____

- a) $3 (b^2 \sin^2 \theta \cos \theta - a^2 \cos^2 \theta \sin \theta)$
 b) $3 (b^3 \sin^2 \theta \cos \theta - a^3 \cos^2 \theta \sin \theta)$
 c) $3 (a^3 \sin^2 \theta \cos \theta - b^3 \cos^2 \theta \sin \theta)$
 d) none of these

9) $\int_0^{\pi/2} \sin^7 x \, dx =$ _____

- a) $\frac{16\pi}{35}$ b) $\frac{35\pi}{16}$ c) $\frac{16}{35}$ d) none of these

10) $\int_0^{\pi/2} \sin^4 x \cos^5 x \, dx =$ _____

- a) $\frac{15}{8}$ b) $\frac{8}{15}$
 c) $\frac{8\pi}{15}$ d) none of these

11) $\int_0^{\pi/2} \cos^n x \, dx = \frac{(n-1)(n-3)\dots\dots 3.1}{n(n-2)(n-4)\dots\dots 4.2} \frac{\pi}{2}$ then n is _____ number.

- a) even b) odd c) positive d) none of these



- 12) If $\vec{F} = 2xy\mathbf{i} + 3yz\mathbf{j} + 4zx\mathbf{k}$ then $\nabla \cdot \vec{F}$ at the point (1, 2, 3) is _____ units.
a) 20 b) 17 c) 25 d) none of these
- 13) If $\vec{F} = xy\mathbf{i} + yz\mathbf{j} + zx\mathbf{k}$ then $\nabla \times \vec{F} =$ _____
a) $-y\mathbf{i} - z\mathbf{j} - x\mathbf{k}$ b) $y\mathbf{i} + z\mathbf{j} + x\mathbf{k}$
c) $z\mathbf{i} + x\mathbf{j} + y\mathbf{k}$ d) none of these
- 14) If $\vec{F} = x^2y^2z^2\mathbf{i} + x^3y^3z^3\mathbf{j} + x^4y^4z^4\mathbf{k}$ then value of $\text{div} \cdot \text{curl} \cdot \vec{F} =$ _____
a) $\nabla \cdot \vec{F}$ b) $\nabla \times \vec{F}$ c) 0 d) none of these

2. Attempt **any seven** from the following :

14

- 1) Show that the vector $\vec{F} = \frac{-y\mathbf{i} + x\mathbf{j}}{x^2 + y^2}$ is irrotational.
- 2) Define the term Directional derivative.
- 3) If $\phi = x^2 + y^2 + z^2$ then prove that $\text{curl} \cdot \text{grad} \phi = \vec{0}$.
- 4) Evaluate $\int_0^{\pi/4} \sin^7 2\theta \, d\theta$.
- 5) Evaluate $\int_0^{\infty} \frac{x^2}{(1+x^6)^{7/2}} \, dx$.
- 6) Investigate the continuity of the function $f(x, y) = \frac{x^3y^2}{x^6 + y^4}, (x, y) \neq (0, 0)$
 $= 0,$ otherwise.
- 7) If $z = x^2 + y^2, x = at^2, y = 2at$ find $\frac{dz}{dt}$.
- 8) If $y = a^{mx}$ then find y_n .
- 9) If $y = \frac{1}{x^2 - 4x + 3}$ find y_n .



3. A) Attempt **any two** from the following : 10

1) If $y = \sin^{-1}x$ then prove that $(1 - x^2) y_{n+2} - (2n + 1) x y_{n+1} - n^2 y_n = 0$

2) Obtain the reduction formula for $\int_0^{\pi/2} \cos^n x dx$.

3) Define divergence and curl of a vector and prove that $\text{div}(\text{curl } \vec{F}) = 0$.

B) Let $z = f(x, y)$ and $x = \phi(t)$, $y = \psi(t)$ then prove that $\frac{dz}{dt} = \frac{\partial z}{\partial x} \frac{dx}{dt} + \frac{\partial z}{\partial y} \frac{dy}{dt}$. 4

4. Attempt **any two** from the following : 14

1) Obtain the reduction formula for $\int_0^{\pi/2} \sin^m x \cdot \cos^n x dx$ and hence evaluate

$$\int_0^{\pi/2} \sin^8 x \cdot \cos^4 x dx.$$

2) Prove that, $\nabla^2 [f(r)] = f''(r) + \frac{2}{r} f'(r)$.

3) If $z = F(u)$, where z is a homogeneous function in x and y of degree n

then prove that $x^2 \frac{\partial^2 u}{\partial x^2} + 2xy \frac{\partial^2 u}{\partial x \partial y} + y^2 \frac{\partial^2 u}{\partial y^2} = G(u) \{G'(u) - 1\}$ where

$$G(u) = n \frac{F(u)}{F'(u)}.$$

5. Attempt **any two** from the following : 14

1) State and prove Euler's theorem on homogeneous functions and verify if for $z = x^3 y^2 + x^5 + y^5$.

2) State and prove Leibnitz's theorem and hence find n^{th} derivative of $x^3 \sin x$.

3) If $I_n = \frac{d^n}{dx^n} \{x^n \cdot \log x\}$ then prove that :

i) $I_n = n I_{n-1} + (n-1)!$

ii) $I_n = n! \left\{ \log x + 1 + \frac{1}{2} + \frac{1}{3} + \dots + \frac{1}{n} \right\}$



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B.Sc. – I (Semester – I) (New CBCS) Examination, 2017
ELECTRONICS (Paper – I)
Basic Circuit Theory and Network Analysis

Time : 2.30 Hours

Max. Marks : 70

- Instructions:** 1) **All questions are compulsory and carry equal marks.**
2) **Figures to the right indicate full marks.**
3) **Use of calculator is permissible.**
4) **Draw neat labeled diagram whenever necessary.**

1. Choose correct alternative and rewrite the sentence : 14

- 1) The working principle of transformer is based on _____
 - a) Self inductance
 - b) Conduction
 - c) Mutual inductance
 - d) None of these
- 2) An ideal current source has _____ internal resistance.
 - a) Infinite
 - b) Finite
 - c) Zero
 - d) All of these
- 3) Parallel resonance circuit is also called as _____ circuit.
 - a) Acceptor
 - b) Rejecter
 - c) Voltage Magnifier
 - d) None of these
- 4) Kirchoff's voltage law is applied to _____
 - a) Node
 - b) Open circuit
 - c) Close loop
 - d) None of these
- 5) The Z parameters are same as _____ circuit impedance parameters.
 - a) Open
 - b) Short
 - c) Hybrid
 - d) None of these
- 6) The main purpose of fuse is _____
 - a) To protect the circuit from the excessive temperature
 - b) To protect the circuit against the excessive current
 - c) To protect the circuit against the excessive voltage
 - d) None of these
- 7) In pure capacitive circuit the current is _____ with applied voltage.
 - a) In phase
 - b) Out of phase
 - c) Lagging
 - d) Leading

P.T.O.



- 8) A sinusoidal AC current RMS value of 50 Amp; its maximum value is _____ Amp.
- a) 78.61 b) 70.72 c) 25 d) 100
- 9) A RLC circuit is said to inductive if _____
- a) $X_L = X_C$ b) $X_L < X_C$ c) $X_L > X_C$ d) $X_L \leq X_C$
- 10) The hybrid parameters are h_{11} is called as _____
- a) Output conductance b) Reverse voltage gain
c) Forward current gain d) Input impedance
- 11) The color code for $330\Omega \pm 10\%$ resistor is _____
- a) Orange Orange Black Silver b) Orange Orange Black Gold
c) Orange Orange Brown Silver d) Orange Orange Brown Gold
- 12) The π network is also called as _____ network.
- a) T b) Star c) Delta d) Hybrid
- 13) The bandwidth of resonance circuit more than, its quality factor Q is _____
- a) High b) Low c) Very high d) None of these
- 14) After applying Norton's theorem; equivalent circuit will have a new _____
- a) Voltage source in series with resistance
b) Current source in series with resistance
c) Current source in parallel with resistance
d) Voltage source in parallel with resistance

2. Attempt **any seven** of the following :

14

- 1) Define inductance, state its practical units.
- 2) If the inductor of 50 mH is connected to a 120 V, 50 Hz supply, find out the inductive reactance.
- 3) Define the term :
 - i) Resonating frequency
 - ii) Band width of a series RLC circuit.
- 4) State Kirchoff's voltage and current law.
- 5) Draw the symbol of
 - a) Iron core inductor
 - b) Variable capacitor
 - c) Step down transformer
 - d) Variable resistor.

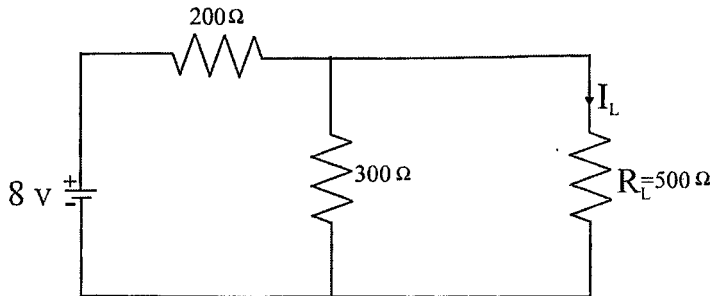


- 6) Define impedance, state its unit.
- 7) Calculate the resonant frequency of a parallel LCR circuit has an inductor of 1 mH and capacitor of 10 μ f .
- 8) What are admittance parameters ? Give their formulas.
- 9) Define branch and node of a network.

3. A) Attempt **any two** of the following : 10

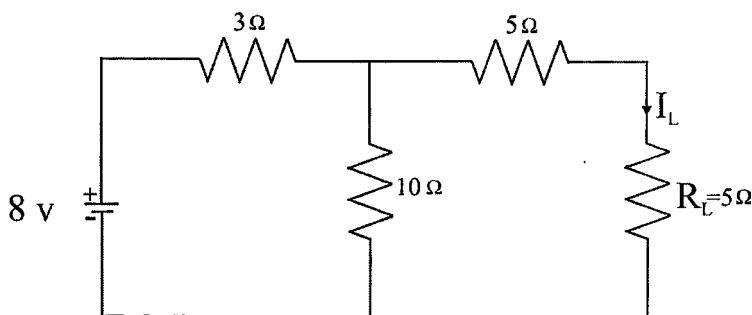
- 1) Define capacitance, state its practical units. Give the classification of capacitor.
- 2) Explain phase relationship of voltage and current in pure resistor and capacitor.
- 3) State and prove Maximum Power Transfer Theorem.

B) Find out current flowing through load resistance R_L of a following dc network using Thevenin's theorem. 4



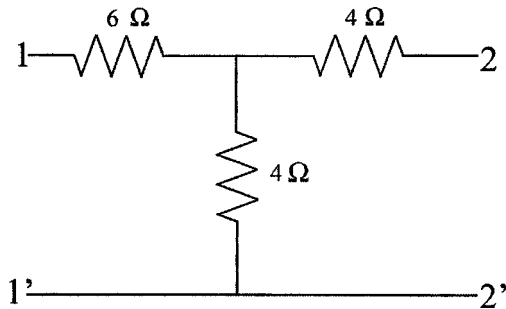
4. Attempt **any two** of the following : 14

- 1) State Norton's theorem. Find the current flowing through load resistance by using Norton's theorem of the following dc circuit.





2) Find the value of h-parameters of the following circuit :

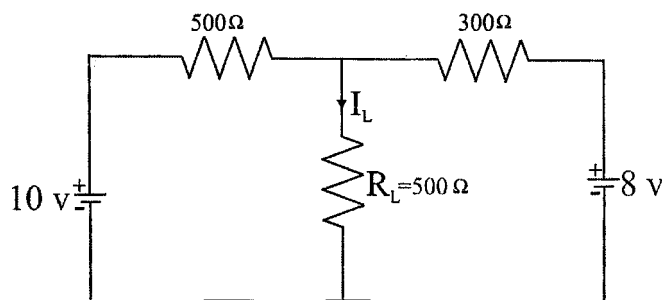


3) Explain the behavior of series RLC circuit as resistive, capacitive and inductive.

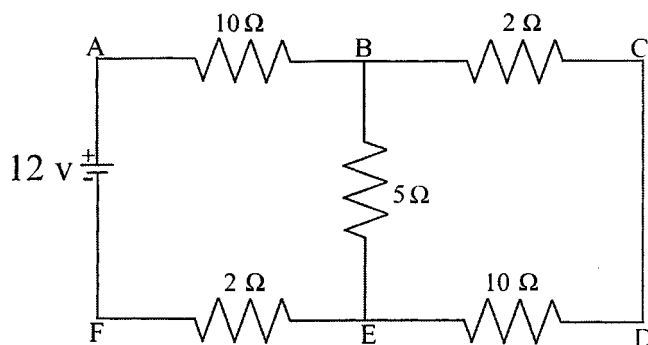
5. Attempt **any two** of the following :

14

1) State Superposition theorem. Find out current flowing through load resistance R_L of a following dc network using superposition theorem.



2) Find out current flowing through each branch of following dc network using Mesh analysis.



3) Compare Series and Parallel resonance circuit.



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B.Sc. – I (Semester – I) (CBCS) (New) Examination, 2017
ELECTRONICS
Digital Fundamentals (Paper – II)

Time : 3 Hours

Max. Marks : 70

- Instructions :** 1) **All questions are compulsory and carry equal marks.**
2) **Figures to the right indicate full marks.**
3) **Use of calculator is permissible.**
4) **Draw neat labeled diagram whenever necessary.**

1. Choose the correct alternative and rewrite the sentence : **14**
- 1) The radix of binary number system is
i) 10 ii) 2 iii) 8 iv) 16
- 2) ASCII is a _____ bit binary code.
i) 7 ii) 32 iii) 8 iv) 16
- 3) The _____ gate is used as universal gate.
i) AND ii) OR iii) NOT iv) NOR
- 4) Boolean addition is provided by _____ gate.
i) AND ii) NOT iii) OR iv) NOR
- 5) In Boolean algebra $A+A+A=$ _____
i) 1 ii) A^3 iii) A iv) 0
- 6) In K map _____ eliminates two variables.
i) Pair ii) Quad iii) Octate iv) None of these
- 7) The _____ gate is used as controlled inverter.
i) AND ii) OR iii) EX-OR iv) NOR
- 8) In _____ gate, if $A = 1, B = 1$ then output $Y = 0$.
i) AND ii) OR iii) NOT iv) NOR

P.T.O.



- 9) The 2's complement of 0101 is
i) 0110 ii) 0101 iii) 1011 iv) 1010
- 10) In Boolean algebra $A(A + B) =$ _____
i) 1 ii) B iii) A iv) 0
- 11) The excess 3 code is _____ code.
i) weighted ii) unweighted
iii) both i and ii iv) none of these
- 12) IC 7400 contains four _____ gates.
i) AND ii) OR iii) NOT iv) NAND
- 13) The 4 bit parallel binary adder adds _____ number of bits.
i) One ii) Two iii) Three iv) Four
- 14) The _____ is the invalid octal number.
i) 125 ii) 256 iii) 528 iv) 525

2. Attempt **any seven** of the following :

14

- 1) Draw the symbol and truth table of OR gate.
- 2) State any four rules of Boolean algebra.
- 3) Draw the logic diagram of half adder.
- 4) Draw the logic diagram for logic equation $Y = AB + C$.
- 5) What is hexadecimal number system ?
- 6) Draw pinout diagram of IC 7404.
- 7) What is universal gate ?
- 8) Convert decimal number 13 into equivalent binary number.
- 9) State the full form of ASCII Code.

3. A) Attempt **any two** of the following :

10

- 1) Convert 9875_{10} into equivalent hexadecimal number.
- 2) Explain full adder circuit with logic diagram.
- 3) Explain the K-map for three variables with suitable example.

B) State and explain any two laws of Boolean algebra with logic diagram.

4



4. Attempt **any two** of the following : **14**

- 1) Explain the universality of NAND gate.
- 2) State and prove De Morgan's theorems.
- 3) Explain any three logic gates in detail.

5. Attempt **any two** of the following : **14**

- 1) Explain 4-bit parallel binary adder circuit with suitable diagram.
- 2) Simplify

$$Y = \overline{A}\overline{B}\overline{C}\overline{D} + \overline{A}\overline{B}C\overline{D} + \overline{A}B\overline{C}\overline{D} + \overline{A}B\overline{C}D + \overline{A}BC\overline{D} + \overline{A}BCD + A\overline{B}\overline{C}\overline{D} + A\overline{B}C\overline{D} + ABC\overline{D} + ABCD \text{ using K-map.}$$

- 3) Explain the various blocks of digital computer with suitable diagram.
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B.Sc. – I (Semester – I) (New-CBCS) Examination, 2017
Paper – I : COMPUTER SCIENCE
Fundamental of Computer

Time : 2 ½ Hours

Total Marks : 70

Instructions : i) **All questions are compulsory.**
ii) **Figure to the right indicates full marks.**

1. Choose the correct alternative :

14

1) In which generation of computers micro-chips were first introduced ?

- A) First Generation B) Second Generation
C) Third Generation D) Fourth Generation

2) _____ is a scanning device.

- A) MICR B) Trackball C) Touch screen D) Mouse

3) ALU stands for _____

- A) Array Logic Unit B) Application Logic Unit
C) Arithmetic Logic Unit D) None of these

4) 1 GB means _____

- A) 1024 bytes B) 1024 MB C) 1024 GB D) 1025 MB

5) DOS stands for _____

- A) Disk Operating System B) Disk Open System
C) Disk Operable System D) None of these

6) _____ is the extension in MS-word.

- A) .doc B) .dox C) .document D) .html



- 7) Which of the following is used to manage hardware and I/O operation of a computer ?
- A) Operating System
 - B) Performance Management System
 - C) Language Translator
 - D) Database Management System
- 8) _____ is not a part of an operating system.
- A) Job Control Program
 - B) Performance Monitor
 - C) Supervisor
 - D) I/O Control Unit
- 9) The small graphic or symbol that represents a program file, folder or device is _____
- A) Desktop
 - B) Monitor
 - C) Pointer
 - D) Icons
- 10) Which tab would you select to display gridlines in the document ?
- A) Insert
 - B) Page Layout
 - C) View
 - D) Review
- 11) By default how many worksheet appear in the sheets ?
- A) 2
 - B) 3
 - C) 4
 - D) 5
- 12) Operating System Act as an _____ between user and Hardware.
- A) Interchange
 - B) Operation
 - C) Interface
 - D) None of these
- 13) _____ command used to create text file in DOS.
- A) text
 - B) copy
 - C) copy con
 - D) file
- 14) _____ mobile operation system used in many mobile.
- A) Linux
 - B) DOS
 - C) Android
 - D) None of these

2. Answer **any seven** of the following :

14

- 1) EDVAC stands for.
- 2) Explain dir command.
- 3) What is meant by software ? State different types of software.
- 4) Explain type command.



- 5) Is DOS Multiuser Operating System ? Comment on it.
 - 6) What is meant by file ?
 - 7) UNIVAC stands for.
 - 8) SMPS stands for.
3. A) Answer **any two** of the following : **10**
- 1) Define computer. Explain characteristics of computer.
 - 2) Explain functions of operating system.
 - 3) Write mail merge process.
- B) Difference between DOS and windows. **4**
4. Answer **any two** of the following : **14**
- 1) Explain android mobile operating system.
 - 2) Explain ROM and its different types.
 - 3) Explain keyboard in detail.
5. Answer **any two** of the following : **14**
- 1) Summarize the features of MS-word.
 - 2) Explain evaluation of computer.
 - 3) Explain different types of Operating System.
-



- 13) What is the size of an int data type ?
- A) 4 Bytes
 - B) 8 Bytes
 - C) Depends on the system/compiler
 - D) None of these

- 14) All keywords in C are in
- A) Upper Case letters
 - B) Lower Case letters
 - C) Camel Case letters
 - D) None of these

2. Answer **any seven** of the following : **14**

- 1) What is algorithm ?
- 2) What is Compiler ?
- 3) What is Assembler ?
- 4) What is Interpreter ?
- 5) Write four data types of 'C' language.
- 6) Rules of declaration variable name.
- 7) Syntax of if-else statement.
- 8) Advantages of flowcharts.
- 9) Write operators of 'C' language.

3. A) Answer **any two** of the following : **10**

- 1) Explain programming language.
- 2) Explain declaration and initialization of string.
- 3) Explain structure of 'C' programming.

B) Write a program to calculate addition of two numbers. **4**

4. Answer **any two** of the following : **14**

- 1) What is flowchart ? Explain flowchart symbols.
- 2) Explain looping statement.
- 3) Write a program to find given number is Armstrong or not.

5. Answer **any two** of the following : **14**

- 1) What is array ? Explain types of array.
 - 2) Explain advantages and disadvantages of algorithm. Write algorithm of maximum of two numbers.
 - 3) Write a program to find factorial of given number.
-



- 8) _____ waves introduced at that time, whenever an earthquake took place onto ocean bottom.
- a) Tsunami b) Tidal c) Longitudinal d) Transverse
- 9) The average density of the earth is _____ gm/cm³.
- a) 13.6 b) 10.0 c) 5.5 d) 2.67
- 10) The forces which are originated in the interior earth, known as _____ forces.
- a) tidal b) gravitational c) endogenic d) exogenic
- 11) _____ ocean is famous to fire ring of earthquakes and volcanisms in world.
- a) Atlantic b) Pacific c) Indian d) Arctic
- 12) Fumaroles are related to _____ activity.
- a) Seismic b) Vulcuncity c) Weathering d) Denudational
- 13) The continental drift theory has postulated by _____
- a) Alfred Wegener b) W.M. Davis c) C.D. Harris d) Guttenberg
- 14) _____ instruments are used to record the intensity of earthquakes.
- a) Pantograph b) Barograph c) Thermograph d) Seismograph

2. Write answers in short (**any seven**) :

14

- 1) Give the sequential name of all planets in solar system.
- 2) Explain the characteristics of primary waves.
- 3) Explain the importance of geomorphology.
- 4) State the material composition of SIAL and SIMA.
- 5) What is a upward forces ?
- 6) Give the examples of folding mountains.
- 7) Which type of materials ejected in volcanism ?
- 8) Interior temperature of earth.
- 9) Classification of magma on the basis of silica content.



3. A) Write a short notes on **any two** of the following : **10**
- i) Chamberlion's planetesimal hypothesis.
 - ii) Causes of earthquake.
 - iii) Vertical forces.
- B) Describe the plate tectonic movement. **4**
4. Write answers **any two** of the following : **14**
- i) What is a volcanoes ? Classify it on the basis of eruption and periodicity.
 - ii) Describe the structure and composition of interior earth.
 - iii) Discuss the concept of Wegeners continental drift theory.
5. Write answers **any two** of the following : **14**
- i) What is a folding ? State its various types with schematic diagrams.
 - ii) State the seismic belts on the earth surface.
 - iii) Describe the nature and scope of geomorphology.
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**B.Sc. (Part – I) (Semester – I) (CBCS Pattern) (New) Examination, 2017
PHYSICAL GEOGRAPHY
GEOMORPHOLOGY (Paper – II)**

Time : 2½ Hours

Max. Marks : 70

- N.B. :** 1) **All questions are compulsory.**
2) **Figures to the right indicate full marks.**
3) **Neat diagrams must be drawn wherever necessary.**
4) **Use of map stencils is allowed.**

1. Select the proper answer from the given below and rewrite the sentences : **14**

- 1) The process of disintegration and decomposition of rocks is called as _____
a) Denudation b) Weathering c) Erosion d) Transportation
- 2) _____ weathering is more dominant in hot desert regions.
a) Physical b) Chemical c) Biological d) Anthropogenic
- 3) Deltas are formed in the _____ stage of river.
a) First b) Second c) Third d) None of them
- 4) 'U' shaped valley is formed by the _____ work of glacier.
a) Erosional b) Transportational
c) Depositional d) None of them
- 5) Marble is an example of _____ rocks.
a) Igneous b) Metamorphic
c) Stratified d) Sedimentary
- 6) Yardang and Zuegen are frequently found in _____ areas.
a) Coastal b) Desert c) Glaciated d) Plain
- 7) Generally carbonation process is commonly found in _____ areas.
a) Humid b) Cold desert c) Hot desert d) None of them



- 8) Frost weathering is more common in _____ areas.
a) Cold b) Hot c) Temperate d) Equatorial
- 9) The biggest delta 'Sunderban' is found in _____
a) U.S.A. b) India
c) United Kingdom d) China
- 10) _____ is the biggest desert regions in the world.
a) Sahara b) Atacama c) Thar d) Gobi
- 11) _____ is formed by the depositional work by wind.
a) Loessic plain b) Driekanter c) Mashroom d) Zeugen
- 12) _____ has postulated the concept of 'cycle of erosion'.
a) Alfred Wegener b) W. M. Davis
c) Chamberlin d) Norish Russel
- 13) Beaches are the depositional landforms made by _____
a) Glacier b) Underground water
c) Oceanic waves d) Winds
- 14) 'Oasis' is found in _____ topography.
a) Desert b) Coastal c) Riverine d) None of them

2. Write answers in short (**any seven**) :

14

- 1) Define rocks.
- 2) Give the types of weathering.
- 3) Types of sand dunes.
- 4) Depositional features made by glacier.
- 5) Give the examples of igneous rocks.
- 6) Explain the different processes of erosional work of river.
- 7) State the economic importance of sedimentary rocks.
- 8) Types of biological weathering.
- 9) Give the types of moraines.



3. A) Write a short notes on **any two** of the following : **10**
- i) Formation process of delta
 - ii) Classification of sedimentary rocks
 - iii) Migration of sand dunes.
- B) What is a physical weathering and state various factors affecting on it ? **4**
4. Write answers **any two** of the following : **14**
- i) Define chemical weathering and state its types with good examples.
 - ii) Describe the various landforms in the erosional work of river.
 - iii) Describe the concept of 'Cycle of Erosion'.
5. Write answers **any two** of the following : **14**
- i) Define igneous rocks and state its classification with good examples.
 - ii) Describe the erosional landforms formed by wind.
 - iii) Describe the erosional work of glacier.
-



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**B.Sc. I (Semester – I) (CBCS Pattern) (New) Examination, 2017
ZOOLOGY**

Paper – I : Animal Diversity – I

Time : 2½ Hours

Max. Marks : 70

1. Rewrite the sentences by choosing correct alternative : 14
- i) _____ contractile vacuoles are present in Paramecium.
a) One b) Two c) Three d) Four
 - ii) Tape worm belongs to the Phylum _____.
a) Aschelminthes b) Platyhelminthes
c) Coelenterata d) Porifera
 - iii) In Sycon water current enters in the body through _____.
a) Ostia b) Osculum
c) Apopyle d) Prosopyle
 - iv) Hydra belongs to the class _____.
a) Scyphozoa b) Hydrozoa
c) Calcarea d) Ciliata
 - v) Amoeba belongs to the Phylum _____.
a) Protozoa b) Porifera
c) Coelenterata d) Nematoda
 - vi) In Hydra _____ cells are capable of developing into any type of cells.
a) Muscular b) Gland
c) Interstitial d) Cnidoblasts
 - vii) Tapeworm is _____ parasite.
a) Ectoparasite b) Obligatory
c) Endoparasite d) Facultative



3. A) Attempt **any two** (out of three) of the following : **10**
- i) Describe with neat labeled diagram sycon type of canal system and its functions.
 - ii) Describe locomotion in Hydra.
 - iii) Describe parasitic adaptations in tape worm.
- B) Discuss Coelom in earthworm. **4**
4. Attempt **any two** (out of three) of the following : **14**
- i) Describe morphology of earthworm, *Pheretima posthuma*.
 - ii) Describe binary fission in paramoecium.
 - iii) Give salient features of Phylum Annelida.
5. Attempt **any two** (out of three) of the following : **14**
- i) Describe in detail with neat labeled diagram digestive system of earthworm.
 - ii) Describe any four cell types in Hydra.
 - iii) Describe morphology of tape worm.
-



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**B.Sc. (Part – I) (Semester – I) (New CBCS) Examination, 2017
ZOOLOGY (Paper – II)
(Cell Biology and Genetics)**

Time : 2½ Hours

Total Marks : 70

- Instructions :** 1) *All questions are compulsory.*
2) *Figures to right indicate full marks.*
3) *Draw neat labeled diagrams wherever necessary.*

1. Complete the sentence selecting appropriate answer : 14

- 1) _____ is common tool for the cell study in a working laboratory.
a) Compound microscope b) Electron microscope
c) Light microscope d) Phase contrast microscope
- 2) _____ is light source in electron microscope.
a) Halogen b) Tungston c) X-rays d) Fluorescent
- 3) _____ is an example of prokaryotic cell.
a) Plant cell b) Nerve cell
c) Bacterium d) Muscle cell
- 4) _____ is a nucleated cell in mammals.
a) WBC b) Thrombocytes
c) RBC d) Epithelial cells
- 5) _____ called hereditary material.
a) Peroxisomes b) Ribosomes
c) Lysosomes d) Chromosomes
- 6) Fluid mosaic model of plasma membrane is given by _____
a) Robert Brown b) Singer and Nicholson
c) De Duve d) Camillo Golgi
- 7) _____ is called as power houses of cell.
a) Mitochondria b) Ribosomes
c) Lysosomes d) Chromosomes

P.T.O.



3. A) Answer **any two** of the following : **10**
- i) Give an account of Mendel's pattern of inheritance.
 - ii) Describe sickle cell anemia.
 - iii) Give an account of compound microscope.
- B) Describe the structure of nucleus. **4**
4. Answer **any two** of the following : **14**
- i) What are Mendel's laws ? Describe the law of dominance.
 - ii) Describe the structure and functions of Golgi complex.
 - iii) With the neat labeled diagram describe the structure of eukaryotic cell.
5. Answer **any two** of the following : **14**
- i) Describe the structure and types of lysosomes.
 - ii) Describe the structure and functions of Mitochondria.
 - iii) With the help of suitable example explain the environmental method of sex determination.
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B.Sc. – I (Semester – I) (CBCS Pattern) Examination, 2017
BOTANY (New)
Paper – I : Microbiology and Phycology

Time : 2¹/₂ Hours

Max. Marks : 70

- Instructions:** 1) **All questions are compulsory.**
2) Draw **neat** labelled diagrams **wherever** necessary.
3) Figures to the **right** indicate **full** marks.

1. Rewrite the following sentences by choosing correct alternatives : 14
- 1) Virology is the study of _____
a) Viruses b) Bacteria
c) Algae d) Fungi
 - 2) _____ is an example of plant viruses.
a) Influenza virus b) TMV
c) Adenovirus d) None of these
 - 3) Mycoplasma are responsible for diseases in _____
a) Plants b) Animals
c) Plants and animals d) None of these
 - 4) PPLO and MLO terms are commonly used for _____
a) Blue green algae
b) Plant viruses
c) Crustose lichen
d) Mycoplasma
 - 5) The virus that infects bacteria are called as _____
a) Bacteriophages b) Plant viruses
c) Animal viruses d) All the above
 - 6) The shape of coccus bacterium is _____
a) Spiral b) Spherical
c) Rod like d) None of these



3. A) Answer **any two** of the following : (2×5=10)
- i) Give role of algae in agriculture.
 - ii) Give general characters of viruses.
 - iii) Describe the vegetative methods of reproduction in algae.
- B) Give an economic importance of bacteria. 4
4. Answer **any two** of the following : (2×7=14)
- i) Describe the structure of a typical virus.
 - ii) Describe the reproduction methods in Nostoc.
 - iii) Give the general characters of chlorophyta.
5. Answer **any two** of the following : (2×7=14)
- i) Describe the scalariform conjugation in *Spirogyra*.
 - ii) Describe the reproduction in *Sargassum*.
 - iii) Give an economic importance of viruses.
-



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B.Sc. – I (Semester – I) (New) (CBCS Pattern) Examination, 2017
BOTANY (Paper – II)
Biomolecules and Cell Biology

Time : 2½ Hours

Max. Marks : 70

- Instructions:** 1) *All questions are compulsory.*
2) *Draw neat and labelled diagrams wherever necessary.*
3) *Figures to the right indicate full marks.*

1. Rewrite the following sentences by choosing correct answer from the given alternatives :

14

- 1) In water molecule, the angle between two hydrogen atoms is about
a) 108° b) 110° c) 105° d) 90°
- 2) When H⁺ ion concentration decreases in solution then pH shows _____ in nature.
a) Acidic b) Basic c) Neutral d) None of them
- 3) Sucrose is a type of
a) Monosaccharides b) Disaccharides
c) Polysaccharides d) None of these
- 4) The chromosomes are lies on equatorial line in the
a) Prophase b) Metaphase c) Anaphase d) None of the above
- 5) Nucleus is absent in
a) Prokaryotic cell b) Eukaryotic cell
c) Plant cell d) Animal cell
- 6) _____ is fundamental, structural and functional unit of living organisms.
a) Atom b) Molecule c) Cell d) Gene
- 7) An enzyme _____ is present in the Gloxysomes.
a) Catalase b) Lyase c) Ligase d) Dehydrogenase
- 8) The term cell plate is used in _____ of cell wall.
a) First b) Second c) Neotonic d) Ontogenic
- 9) Buffer is mixture, the mixture of salts of weak acid and its
a) Strong base b) Weak base c) Strong acid d) None of them
- 10) The plant cell wall is mainly composed of
a) Cellulose b) Hemicellulose c) Lignins d) All of the above

P.T.O.



- 11) Enzymes are also known as
a) Biocatalyst b) Bioindicators c) Retardance d) Inhibitors
- 12) The synthesis of DNA occurs in
a) G1 phase b) G2 phase c) S phase d) Division phase
- 13) In prokaryotic cell _____ is absent.
a) Chloroplast b) Ribosome c) DNA d) All of these
- 14) Eukaryotic ribosomes are
a) 80s b) 60s c) 50s d) 30s

2. Answer **any seven** of the following : **14**
- 1) Sketch and label structure of Prokaryotic cell.
 - 2) Define microbodies.
 - 3) Give any two functions of cell membrane.
 - 4) Define pH.
 - 5) What is composition of cell wall ?
 - 6) Enlist the types of Carbohydrates.
 - 7) Explain the metaphase of Mitosis.
 - 8) Write in brief significance of Buffer.
 - 9) What is structure of water molecule ?
3. A) Attempt **any two** of the following : **10**
- 1) Describe the co-enzymes and co-factors.
 - 2) Describe the structure of DNA.
 - 3) Explain the Lock and Key hypothesis.
- B) Sketch and label ultrastructure of Eukaryotic cell. **4**
4. Attempt **any two** of the following : **14**
- 1) Describe chemical and physical properties of Monosaccharides and Polysaccharides.
 - 2) Describe the origin and ultrastructure of cell wall.
 - 3) What is the cell membrane ? Describe the ultrastructure and chemical composition of cell membrane.
5. Attempt **any two** of the following : **14**
- 1) Describe the various stages of Mitosis.
 - 2) Define biomolecules. Describe the structure and properties of water.
 - 3) Describe the microbodies with reference to occurrence, structure and functions of peroxysomes.
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B.Sc. (Part – I) (Semester – I) (New) (CBCS Pattern) Examination, 2017
PSYCHOLOGY
General Psychology (Paper – I)

Time : 2.30 Hours

Max. Marks : 70

Instructions: 1) *All questions are compulsory.*
2) *Figures to the right indicate full marks.*

1. Choose and write a correct answer of the following **four** alternatives. **14**
- 1) _____ is the scientific study of behaviour and mental process.
A) Psychology B) Cognition C) Self D) Stress
 - 2) _____ includes all of our outward or overt actions and reactions.
A) Behaviour B) Mind C) Society D) Soul
 - 3) _____ process refers to all internal, covert activity of our minds.
A) Mental B) Physical C) Educational D) Social
 - 4) In psychology, there are _____ goals.
A) 03 B) 06 C) 09 D) 12
 - 5) The first step in understanding anything is to give it a name is _____.
A) description B) prediction C) explanation D) control
 - 6) A _____ is a general explanation of a set of observation of facts.
A) mental B) theory C) objective D) happiness
 - 7) The goal of _____ provides the observation, and the goal of explanation helps to build the theory.
A) control B) explanation C) description D) prediction
 - 8) The _____ is composed of the brain and spinal cord.
A) central nervous system B) reuptake
C) endorphin D) disorder
 - 9) The name _____ comes from the term endogenous morphine.
A) disorder B) endorphin C) brain D) anxiety
 - 10) The _____ is the true core of the nervous system.
A) brain B) mind C) soul D) cell

P.T.O.



- 11) The first neurotransmitter to be identified was named
A) acetylcholine B) GABA C) antagonists D) happiness
- 12) _____ are chemical substances that block a cell's response to the action.
A) Antagonists B) Cognitions C) Disorders D) Anxiety
- 13) _____ is a neurotransmitter found in the lower part of the brain.
A) Dopamine B) Serotonin C) GABA D) Endorphin
- 14) The limbic system means _____
A) cognition B) social C) marginal D) abnormal

2. Answer the following (**any seven**). **14**

- 1) Define Psychology.
- 2) Who wrote the textbook on the subject, "Principles of Psychology" ?
- 3) Where was first psychological laboratory ?
- 4) Who wrote "De Anima" ?
- 5) Who developed Psychoanalysis ?
- 6) Who developed Behaviorism ?
- 7) Define Consciousness.
- 8) Define Dream.
- 9) Full form of MRI.

3. A) Short notes (**any two**). **10**

- 1) The contents of consciousness.
- 2) REM sleep.
- 3) Explanation.

B) Discuss on Psychoanalysis. **4**

4. Answer the following (**any two**). **14**

- 1) Explain the Functionalism.
- 2) Explain the Humanistic perspective.
- 3) Explain the Somatic Nervous System.

5. Answer the following (**any two**). **14**

- 1) Explain the necessity of sleep.
 - 2) Explain the Sleep Disorder.
 - 3) Explain the Cognitive Perspective.
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B.Sc. I (Semester – I) (CBCS) (New) Examination, 2017
GEOLOGY (Paper – I)
Mineralogy and Paleontology

Time : 2½ Hours

Max. Marks : 70

- Instructions:** 1) **All questions are compulsory.**
2) Figures to the **right** indicate **full** marks.
3) Draw **neat** labeled diagrams **wherever** necessary.

1. Fill in the blanks using correct answer given in the options : **14**

- 1) Quartz shows _____ set cleavage.
a) 1 b) 2 c) 3 d) no
- 2) Lusture of talc is
a) dull b) vitreous
c) adamantine d) pearly
- 3) Talc shows _____ fracture.
a) conchoidal b) uneven c) earthy d) even
- 4) Colour of Biotite is
a) brown b) colourless c) red d) violet
- 5) Hardness of Amethyst is
a) 1 b) 7 c) 3 d) 10
- 6) Streak of Calcite is
a) white b) red c) black d) green
- 7) Three sets of cleavages is shown by
a) biotite b) talc c) chlorite d) calcite



- 8) Conus shows _____ apex angle.
a) acute b) obtuse c) small d) big
- 9) Pecten shows _____ hinge line.
a) oblique b) curved c) straight d) long
- 10) Shape of Physa is
a) spindle like b) conical c) triangular d) round
- 11) Turbo have _____ whorls.
a) 3 b) 2 c) 4 d) one
- 12) Aperture forming tube at base is _____
a) holostomatous b) round
c) siphonostomatous d) small
- 13) Aperture without tube at base is _____
a) holostomatous b) round
c) siphonostomatous d) small
- 14) Ears are seen in _____
a) productus b) physa
c) pecten d) both a) and c)

2. Answer **any seven** of the following :

14

- i) Define form of Mineral.
- ii) What is streak. of fluorite ?
- iii) What is lusture of flint ?
- iv) What is colour of lepidolite ?
- v) What is form of corundum ?
- vi) What is age of products ?
- vii) What is primary septa ?
- viii) What is secondary septa ?
- ix) What is suture line ?



3. A) Answer **any two** of the following : **10**
- i) Describe the forms of minerals – Drusy, Needle, Stellate. Draw their diagrams.
 - ii) Describe the internal parts of Cephalopoda shell. Draw diagrams.
 - iii) Describe morphological characters of Lamellibranches shell. Draw diagrams.
- B) Describe physical properties of Feldspar group of minerals. **4**
4. Answer **any two** of the following : **14**
- i) Describe forms of minerals – Crystallized, Crystalline, Amorphous. Give examples, draw diagrams.
 - ii) Describe pyroxene group of minerals.
 - iii) Describe corona of cephalopoda shells. Draw diagrams.
5. Answer **any two** of the following : **14**
- i) Describe forms of minerals – Sheaf like, Radiating, Amygdaloidal. Draw diagrams. Give examples.
 - ii) Describe apical system of echinoids. Draw diagram.
 - iii) Describe the morphological characters of Brachiopoda shell. Draw diagram.
-



- viii) Special character of gram negative bacterial cell wall is the presence of
- a) Teichoic acid
 - b) Mycolic acid
 - c) Lipopolysaccharide
 - d) Cellulose
- ix) Streptomyces spp is an example of
- a) Rickettsia
 - b) Actinomycetes
 - c) Fungi
 - d) Bacteria
- x) Shigella is named after scientist
- a) Pasteur
 - b) Neisser
 - c) Shiga
 - d) Escherich
- xi) Locomotion is the function of _____ organelle in bacteria.
- a) Flagella
 - b) Cell membrane
 - c) Capsule
 - d) Cell wall
- xii) _____ type of bacteria that live in extreme environments.
- a) Viruses
 - b) Archaeobacteria
 - c) Actinomycetes
 - d) Eubacteria
- xiii) Liquid media, broth cultures don't show growth in the form of
- a) Turbidity
 - b) Pellicle
 - c) Colonies
 - d) Coloudiness
- xiv) _____ gives shape and rigidity to the bacterial cell.
- a) Cell wall
 - b) Cell membrane
 - c) Capsule
 - d) Flagella

2. Attempt **any seven** (out of nine) of the following :

14

- i) Define spontaneous generation.
- ii) Define antibiotic.
- iii) List morphological characters.
- iv) Consistency.
- v) Examples of archaeobacteria.
- vi) Definition of viruses.
- vii) Functions of capsule.
- viii) Germ theory of disease.
- ix) Active immunization.



3. A) Attempt **any two** (out of three) of the following : **10**
- i) Give criteria for bacterial classification.
 - ii) Contributions of Antony Von Leeuwenhock and Joseph Lister.
 - iii) List beneficial activities of microorganisms.
- B) Give an account on Koch's postulates. **4**
4. Attempt **any two** (out of three) of the following : **14**
- i) Differentiate between procaryotic and eucaryotic cell with a labelled diagram.
 - ii) Give an account on Gram positive cell wall.
 - iii) General characteristics of Actinomycetes.
5. Attempt **any two** (out of three) of the following : **14**
- i) Give general characteristics, structure and economic importance of viruses.
 - ii) Write details on structure, arrangement and functions of flagella.
 - iii) Brief account on various branches of microbiology.
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B.Sc. – I (Semester – I) (CBCS) (New) Examination, 2017
PSYCHOLOGY (Paper – II)
Human Development

Time : 2 $\frac{1}{2}$ Hours

Max. Marks : 70

N. B. : I) **All questions are compulsory.**
II) **Figure to the right indicate full marks.**

1. Multiple Choice Questions :

14

- 1) Adolescence is generally considered to begin at about _____ and end in the late teen or early twenties.
a) 12 or 13 b) 11 or 12 c) 13 or 14 d) 15 or 16
- 2) Adolescents spend their lot of time with _____
a) Peers b) Mother c) Father d) Old people
- 3) _____ believed that the chief task of adolescence is to resolve the conflict of identify vs identity confusion.
a) Piaget b) Erikson c) Anna d) Any other
- 4) _____ is the first sexual experience for most young people.
a) Masturbation b) Intercourse
c) Homosexuality d) Heterosexuality
- 5) According to Sternberg the _____ elements is the insightful aspect of intelligence.
a) Experimental b) Contextual
c) Componential d) Any other
- 6) According to Strenberg's _____ of Love.
a) Triangular b) Four-dimensional
c) Two-dimension d) Eight dimensional
- 7) Alcohol Marijuana and Tobacco are the three drugs most popular with _____
a) adolescence b) middle age c) old age d) children



- 8) Boys and girls slow _____ during adolescence.
a) same b) slow c) differently d) no
- 9) Perry nine stages are divided among _____ border categories.
a) three b) four c) six d) nine
- 10) _____ is the first stages of sexuality.
a) Heterosexuality b) Homosexuality
c) Autosexuality d) Any other
- 11) _____ developed theory of ethical development.
a) Perry b) Carry c) Marray d) Newell
- 12) AIDS was first diagnosed in 1979 at _____ University Medical Center.
a) Ohio b) Michagan
c) Belleve-Newyork d) Solapur
- 13) _____ theory gives more cited explanation of homosexuality.
a) Psycho-analytic b) Humanistic
c) Client centered d) Any other
- 14) The extreme _____ of young adolescents can be explained by the concept of the imaginary audience.
a) Self-esteem b) Self-consciousness
c) Self-confidence d) Any other

2. Write answer in short (**any seven**) :

14

- 1) When does purity stands ?
- 2) What are the two components of Ego-centrism ?
- 3) Define Early adulthood.
- 4) Define preconsciousness.
- 5) What are the three stages of sexuality ?
- 6) What are the seven forms of Love ?
- 7) Define cognitive development.
- 8) What is obesity ?
- 9) What is main function of pituitary gland ?



3. A) Write short note (**any two**) : **10**
- 1) Warner Schaic stages of cognitive development.
 - 2) Work and age in early adulthood.
 - 3) Self concept of adolescence.
- B) Explain the functions of Peer groups in adolescence. **4**
4. Answer **any two** of the following : **14**
- A) Explain the eating disorder in adolescence.
 - B) Discuss the aspects of personality development in adolescence.
 - C) Explain the choice of food in early adulthood.
5. Answer **any two** of the following : **14**
- A) Explain Piaget approaches to cognitive development.
 - B) Explain the physical development in adolescence.
 - C) Discuss elaborately AIDS sexually transmitted disease.
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B.Sc. – I (Semester – I) (New CBCS Pattern) Examination, 2017
GEOLOGY (Paper – II)
Igneous, Sedimentary and Metamorphic Petrology

Time : 2½ Hours

Max. Marks : 70

- Instructions :** 1) **All questions are compulsory.**
2) **Draw neat diagrams wherever necessary.**
3) **Figures to the right indicate full marks.**

1. Fill in the blanks with correct answers from the given options : **14**
- 1) The directed pressure plays predominant role in _____ metamorphic rocks.
a) Dynamo thermal b) Thermal
c) Contact d) Cataclastic
 - 2) Granite is igneous _____ rock.
a) Hypabyssal b) Plutonic c) Volcanic d) Clastic
 - 3) Conglomerate shows _____ structure.
a) Lamination b) Flow c) Salty d) Clastic
 - 4) Alternate schistose and granulose bands are present in _____ structure.
a) Sedimentary b) Igneous c) Flow d) Gneissose
 - 5) Roof pendent is present in _____ rock.
a) Igneous b) Metamorphic c) Sedimentary d) Flaser
 - 6) Dyke having _____ rocks.
a) Metamorphic b) Igneous
c) Cataclastic d) None of these
 - 7) Minerals formed from fire i.e., magma or lava are called as _____ minerals.
a) Calastic b) Fine grained
c) Metamorphic d) Pyrogenetic



3. A) Answer **any two** of the following : **10**
- 1) Explain vesicular and amygdaloidal structure.
 - 2) Explain graded bedding and cross bedding.
 - 3) Explain depth zones.
- B) Write note on composition of magma. **4**
4. Answer **any two** of the following : **14**
- 1) Explain the Rock Cycle.
 - 2) Classification of sedimentary rock.
 - 3) Schistose and gneissose structure.
5. Answer **any two** of the following : **14**
- 1) Igneous concordant intrusions in unfolded region.
 - 2) Explain ripple marks and mud cracks.
 - 3) Agents of metamorphism.
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**B.Sc. – I (Semester – I) Examination, 2017
(New) (CBCS) Pattern
MICROBIOLOGY (Paper – II)
Microbial Techniques**

Time : 2½ Hours

Max. Marks : 70

- N.B. :** 1) *All questions are compulsory and carry equal marks.*
2) *Draw a neat labelled diagram wherever necessary.*
3) *Figure to the right indicates full marks.*

1. Rewrite the following sentences by choosing correct alternatives from given below : **14**

i) The limit of resolution of light microscope is _____

- A) 1 B) 0.2 C) 20 D) 2

ii) The process of separation of microorganism on agar plates is called as _____

- A) Cultivation B) Isolation C) Screening D) Inhibition

iii) The population of more than one type of microorganism is known as _____ culture.

- A) Mixed B) Syntrophic C) Dual D) Pure

iv) The acid fast staining used for staining of _____ bacterial genus.

- A) Mycobacterium B) Rhizobium
C) Bacillus D) E.coli

v) _____ is moist heat type of sterilizer.

- A) Autoclave B) Inspissator C) Seitz filter D) Oven

vi) First electron microscope invented by _____

- A) Van Boris & Ruska B) Watson & Crick
C) Wendel & Stanley D) Louis Pasteur



3. A) Answer **any two** of the following : **10**
- i) Describe in brief mechanism of Monochrome staining.
 - ii) Discuss in detail selective media.
 - iii) Describe in detail sterilization by Radiation.
- B) Give a detailed account of Negative Staining. **4**
4. Answer **any two** of the following : **14**
- i) Describe in detail principle and mechanism of Gram staining.
 - ii) What is Resolution ? Explain in detail ray diagram, working and principle of compound microscope.
 - iii) Define cultivation. Describe in detail streak plate method.
5. Answer **any two** of the following : **14**
- i) Describe in detail pure culture techniques.
 - ii) Discuss in detail capsule staining by Manvel's method.
 - iii) Write an essay on "Electron microscope".
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**B.Sc. – I (Semester – I) Examination, 2017
ENGLISH (Compulsory) (CGPA Pattern) (Old)
'On Track' English Skills for Success**

Time : 2.30 Hours

Total Marks : 70

N.B. : 1) **All questions are compulsory.**
2) Figures to the **right** indicate **full** marks.

1. Complete the following statements by choosing the correct alternatives from these given below **each**.

14

- 1) Bob and Jimmy were _____
 - a) brothers
 - b) enemies of each others
 - c) colleagues
 - d) friends
- 2) The word 'avenue' means _____
 - a) a narrow street
 - b) a wide street
 - c) a room
 - d) a restaurant
- 3) Miss. Krishna's mother left _____ to her.
 - a) a big building
 - b) a huge property
 - c) a tiny cottage
 - d) nothing
- 4) The writer and Miss. Krishna _____
 - a) were at school together
 - b) met at an art exhibition
 - c) were neighbours
 - d) met at a tea party
- 5) IQ Test was developed by _____
 - a) Mr. Binet
 - b) Mr. Bennet
 - c) Ms. Benet
 - d) Mrs. Binet
- 6) Some experts say that _____ intelligence will soon come into existence.
 - a) a scientific
 - b) an artificial
 - c) a technical
 - d) a natural
- 7) The bangle sellers carry the load of shining bangles to the _____
 - a) village fair
 - b) city fair
 - c) temple fair
 - d) none of the above



- 8) The term 'virtual reality' means _____
 a) an environment produced by a computer
 b) a building built by an engineer
 c) a viral reality
 d) an environment destroyed by a man
- 9) W. B. Yeats expresses his _____ with the war.
 a) satisfaction
 b) discontent
 c) willingness
 d) none of the above
- 10) Sarojini Naidu speaks about lack of freedom for _____ in 'Bangle sellers'.
 a) married men
 b) unmarried boys
 c) married women
 d) none of the above
- 11) The plural form of the word 'wolf' is _____
 a) wolfs
 b) wolves
 c) wolves
 d) wolf
- 12) The man _____ the car is Gopichand.
 a) into
 b) of
 c) at
 d) in
- 13) Let's go on _____ picnic today.
 a) a
 b) the
 c) an
 d) No article
- 14) The word 'Teacher' is a _____ noun.
 a) proper
 b) common
 c) abstract
 d) collective

2. Answer in brief **any seven** of the following :

14

- 1) Why did Bob decide to travel to the west ?
- 2) What had happened to 'Big Joe Brady's restaurant ?
- 3) What is the profession of narrator in 'The Connoisseur' ?
- 4) What do you mean by the title 'Connoisseur' ?
- 5) How can you define 'intelligence' ?
- 6) What are the many facets of intelligence ?
- 7) What was the policeman constantly doing with his stick ?
- 8) What did Mr. Binet develop ?

3. A) Write short answers on **any two** of the following.

8

- 1) What is the theme of the poem 'Bangle sellers' ?
- 2) Describe the different types of bangles which the bangle-sellers carry.
- 3) What is the stand of an Irish airman towards the war ?



B) Write paragraphs on **any two** of the following. **6**

- 1) A craze of fashions in the youth.
- 2) The greenhouse effect.
- 3) The performance of Indian players in 2016 Olympic.

4. Write an essay on 'Machine Civilisaiton'. **14**

OR

Write an essay on 'A Meaningful Life'.

5. Read the following passage and make notes of it. Use an appropriate title for your notes. **14**

There are different forms of environmental pollution. Air pollution is caused by the burning coal and oil. It can damage the earth's vegetation and cause respiratory problems in humans. A second type of pollution is noise pollution. It is the result of the noise of aircraft and heavy traffic. Further, loud music is also a cause of noise pollution, which had been seen to affect people's hearing and give them severe headaches and high blood pressure. Another source of pollution is radioactivity, which occurs when there is a leak from a nuclear power station. Radioactivity is a deadly pollutant, which kills and causes irreparable harm to those exposed to it. Land and water pollution is caused by the careless disposal of huge quantities of rubbish, sewage and chemical wastes. Pollution of rivers and seas kills fishes and other marine life and also becomes the cause of water-borne diseases. Land pollution, on the other hand, poisons to soil, making the food grown in it unfit for consumption.



Seat No.	
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B.Sc. – I (Semester – I) Examination, 2017
CHEMISTRY (Paper – I) (CGPA Pattern) (Old)
Physical and Inorganic Chemistry

Time : 2½ Hours

Max. Marks : 70

- Instructions :**
- i) **All questions are compulsory.**
 - ii) Draw **neat**, labelled diagrams **wherever** necessary.
 - iii) Figures to the **right** indicate **full** marks.
 - iv) **Use of log-table and calculator is allowed.**
 - v) Solve **each** Section in **separate** answer book.

SECTION – I

(Physical Chemistry)

1. Select the correct alternative for the following and rewrite the sentences : **5**
- i) The number of molecules or atoms whose concentration changes during the chemical reaction is known as _____ of reaction.
a) molecularity b) velocity c) order d) none of these
 - ii) In a certain graph, the straight line obtained is parallel to X-axis. Hence its slope is
a) zero b) – 1 c) + 1 d) 0.5
 - iii) The process that does not occur of its own accord is called _____ process.
a) spontaneous b) non-spontaneous
c) isothermal d) adiabatic
 - iv) The unit of b in van der Waals equation is
a) $\text{dm}^3 \text{mole}^{-1}$ b) $(\text{dm}^3)^2 \text{mole}^{-1}$
c) $\text{dm}^{-3} \text{mole}$ d) $\text{dm}^3 \text{mole}$
 - v) Rate of reaction
a) increases with increase in temperature
b) decreases with increase in temperature
c) is independent of concentration
d) is independent of temperature



2. Answer **any five** of the following : 10
- i) Write the kinetic equations for second order reaction, when reacting substances are at the same initial concentration and at different initial concentrations.
 - ii) Write any two rules of differentiation.
 - iii) Give any two statements of second law of thermodynamics.
 - iv) Write the reaction of hydrolysis of methyl acetate in presence of HCl.
 - v) What do you mean by ideal gas and non-ideal gas ?
 - vi) Define the term specific reaction rate.
 - vii) What is continuity of a state ?

3. A) Answer **any two** of the following : 10
- i) Explain factors affecting the rate of reaction.
 - ii) What is intercept ? Give its characteristics. Write different forms of straight line equations.
 - iii) Explain Carnot's cycle.

- B) Answer **any one** of the following : 10
- i) Discuss various methods to determine order of reaction.
 - ii) Derive Van der Walls equation.

Van der Walls constants for CO_2 are $a = 0.3636 \text{ Nm}^4 \text{ mol}^{-2}$ and $b = 4.28 \times 10^{-5} \text{ m}^3 \text{ mole}^{-1}$ and $R = 8.314 \text{ JK}^{-1} \text{ mole}^{-1}$. Calculate P_c , V_c and T_c .

SECTION – II

(Inorganic Chemistry)

4. Select the most correct alternative for the following and rewrite the sentences : 5
- 1) S-orbital has _____ shape.
a) dumb-bell b) square c) spherical d) triangular
 - 2) As atomic size increases, ionization potential
a) increases b) decreases
c) remains same d) first increases then decreases
 - 3) The shape of BF_3 molecule is
a) triangular planer b) linear
c) tetrahedral d) hexagonal



- 4) Limiting radius ratio for tetrahedral geometry is
- | | |
|------------------|------------------|
| a) 0.155 – 0.225 | b) 0.414 – 0.732 |
| c) 0.732 – 1.00 | d) 0.225 – 0.414 |
- 5) MOT is discussed on the basis of
- | | |
|-----------------------|--------------------------------|
| a) Hybridization | b) Aufbau principle |
| c) LCAO approximation | d) Pauli's exclusion principle |

5. Answer **any five** of the following : **10**

- i) Give the energetics of ionic bonding.
- ii) State and explain Hund's rule of maximum multiplicity.
- iii) Draw the shapes of d-orbitals.
- iv) Give the steps involved in process of hybridization.
- v) Draw the potential energy diagram for formation of H_2 molecule.
- vi) Give the conditions for successful overlap of atomic orbitals.
- vii) What are bonding and antibonding molecular orbitals ?

6. A) Write short notes on **any two** of the following : **10**

- i) What is electronegativity ? Discuss its trend in a group and in a period in the periodic table.
- ii) Explain the formation of $SiCl_4$ molecule on the basis of VBT.
- iii) On the basis of VSEPR theory explain the formation of ClF_3 molecule.

B) Attempt **any one** of the following : **10**

- i) With the help of MO diagram, predict bond order, stability and magnetic character of N_2 and CO molecules.
 - ii) What is ionic bond ? Discuss the structure of CsCl with respect to radius ratio, unit cell, co-ordination number and stoichiometry.
-

Seat
No.

B.Sc. – I (Semester – I) (CGPA Pattern) (Old) Examination, 2017
PHYSICS (Paper – I)
Mechanics, Properties of Matter and Optics and Laser

Time : 2½ Hours

Max.Marks : 70

- Instructions :** 1) **All questions are compulsory.**
2) **Figures to the right indicate full marks.**
3) **Neat diagrams must be drawn wherever necessary.**
4) **Use of log table and calculator is allowed.**
5) **Answers to the two Sections must be written in separate answer book.**

SECTION – I

(Mechanics and Properties of Matter)

1. Select the correct alternatives from the following :

5

i) Moment of inertia of a spherical shell about its tangent is

a) $\frac{2}{3}MR^2$

b) $\frac{7}{5}MR^2$

c) $\frac{5}{3}MR^2$

d) MR^2

ii) Minimum time period of compound pendulum is

a) $T = 2\pi\sqrt{\frac{k}{g}}$

b) $T = 2\pi\sqrt{\frac{2k}{g}}$

c) $T = 4\pi\sqrt{\frac{k}{g}}$

d) $T = 2\pi\sqrt{\frac{k}{2g}}$

iii) The theoretical limiting values of Poisson's ratio lies between

a) -1 and $+0.5$

b) $+1$ and -0.5

c) -1 and -0.5

d) -1 and $+1$



iv) If “T” is the surface tension of a liquid then the excess pressure inside the liquid drop of radius r is

a) $\frac{2T}{r}$

b) $\frac{4T}{r}$

c) $\frac{T}{4r}$

d) $\frac{T}{2r}$

v) The profile of advancing liquid in the capillary tube is a

a) Ellipse

b) Circle

c) Hyperbola

d) Parabola

2. Answer **any five** of the following :

10

- i) Define moment of inertia and give its SI unit.
- ii) State Bernoulli's theorem.
- iii) Define surface tension and give its SI unit.
- iv) Define centre of suspension and centre of oscillation in a compound pendulum.
- v) Define streamline flow and turbulent flow.
- vi) Calculate moment of inertia of a circular disc having mass 500 gm and radius 0.1 m about an axis passing through centre and perpendicular to its plane.
- vii) Give any two factors affecting surface tension of liquid.

3. A) Answer **any two** of the following :

10

- i) Obtain the expression for moment of inertia of a rectangular lamina about an axis passing through its centre and parallel to its sides.
- ii) In a Jaeger's experiment the difference in the level of manometric liquid of density 0.7 gm/cm^3 is found to be 9 cm. The capillary tube of internal radius 0.25 mm dips 3 cm inside a liquid of density 0.1 gm/cm^3 . Calculate the surface tension of liquid when the bubble just burst.
(given $g = 980 \text{ cm/sec}^2$).
- iii) Obtain the equation of continuity for steady fluid flow.

B) Answer **any one** of the following :

10

- i) Define compound pendulum. Show that oscillations of a compound pendulum perform simple harmonic motion and hence obtain expression for its time period.
- ii) Derive the relation between elastic constants Y, K and η .



SECTION – II
(Optics and Laser)

1. Select the correct alternative from the following : 5

- i) According to the Fermat's modified principle, a ray of light chooses that path between two points along which the time of travel is
 - a) Zero
 - b) Minimum
 - c) Maximum
 - d) Extremum
- ii) A combination of two lenses having focal length $f_1 = 8$ cm and $f_2 = 6$ cm co-axially separated by distance 'd' be achromatic combination, if d is equal to
 - a) 7 cm
 - b) 6 cm
 - c) 8 cm
 - d) 5 cm
- iii) Huygen's eye-piece is
 - a) Negative
 - b) Positive
 - c) Single lens
 - d) Convex lens
- iv) In the Fraunhofer type diffraction, the edge of an obstacle is illuminated by
 - a) Spherical wavefront
 - b) Plane wavefront
 - c) Cylindrical wavefront
 - d) Elliptical wavefront
- v) Ruby laser is
 - a) Semiconductor laser
 - b) Gas laser
 - c) Liquid-dye laser
 - d) Crystalline solid state laser

2. Answer **any five** of the following : 10

- i) What is chromatic aberration ?
- ii) State any two applications of spectrometer.
- iii) Define diffraction of light. State the types of diffraction.
- iv) Draw a ray diagram for wedge shaped thin films.
- v) State any two characteristics of laser.
- vi) What is population inversion ?
- vii) If the dispersive power of crown glass is 0.024 and focal length is 20 cm, find the longitudinal chromatic aberration.



3. A) Answer **any two** of the following :

10

- i) Explain principle and working of a He-Ne laser.
- ii) Draw a neat ray diagram of Ramsden eyepiece and derive an expression for focal length of it.
- iii) Two thin lenses form an achromatic combination of focal length 30 cm. The focal length of convex lens is 10 cm and its dispersive power is 0.032. Find the focal length and dispersive power of the second lens.

B) Answer **any one** of the following :

10

- i) Explain the construction of plane diffraction grating. Give the elementary theory of plane diffraction grating.
 - ii) Obtain an expression for the optical path difference between two successively reflected rays of monochromatic light for a thin parallel faced film. Hence obtain the condition for maximum and minimum of interference. A parallel beam of light of wavelength 6000 A.U. is incident on a thin glass plate of refractive index 1.54. The angle of refraction is 60° . Calculate the minimum thickness of the plate so that it appears completely dark in reflected light.
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Seat No.	
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B.Sc. – I (Semester – I) (CGPA Pattern) (Old) Examination, 2017
STATISTICS (Paper – I)
Descriptive Statistics, Probability and Probability Distributions – I

Time : 2½ Hours

Max. Marks : 70

- N. B. :** 1) Figures to the **right** indicate **full** marks.
2) Answers of **two** Sections should be written in **same** answer book.

SECTION – I
(Descriptive Statistics, Probability)

1. Choose the correct alternative :

5

- 1) With help of an ogive curve; one can determine
a) Median b) Mean c) Mode d) None of these
- 2) If x_1, x_2, \dots, x_n are n observations with mean \bar{X} , then $\sum_1^n (x_i - \bar{X})$
is
a) Necessarily zero b) Necessarily non-negative
c) May be non-negative d) May be zero
- 3) Mean deviation is least when measures from _____
a) Mean b) Median c) Mode d) Zero
- 4) The first order moment about 5 is 7, then the mean is equal to
a) 5 b) 7 c) 12 d) None of these
- 5) The measure of kurtosis β_2 for a platykurtic curve is _____
a) Greater than 3 b) Less than 1
c) Equal to 3 d) Less than 3

P.T.O.



2. Answer **any five** of the following : **10**
- i) Define discrete variable and continuous variable.
 - ii) Define frequency and cumulative frequency.
 - iii) Define median and mode.
 - iv) State empirical relation between mean, median and mode. Use it to find mode of the distribution whose mean is 78 and median is 72.
 - v) Define range and quartile deviation.
 - vi) State the combined variance formula.
 - vii) Write a note on Sheppard's correction.
3. A) Write short note on **any two** of the following : **10**
- i) Explain the construction of histogram.
 - ii) Show that sum of squares of deviation taken from mean is minimum.
 - iii) What is the effect of change of origin and scale on S.D. ?
- B) Answer **any one** of the following : **10**
- i) Define A.M., G.M., H.M. for any two positive observations a and b show that $A.M. \geq G.M. \geq H.M.$
 - ii) Define standard deviation and mean deviation about mean. Show that standard deviation is always greater than or equal to mean deviation about mean.

SECTION – II

(Probability Distributions – I)

4. Choose the correct alternative : **5**
- 1) A ticket is drawn from 25 tickets numbered 1 to 25. Define an event as : the number drawn is odd number. The number of elements in this event is
- a) 11
 - b) 12
 - c) 13
 - d) 25



2) If A and B are two events, the probability of occurrence of both A and B is given by

- a) $P(A \cup B)$ b) $P(A \cap B)$ c) $P(A) + P(B)$ d) $P(A) - P(B)$

3) Let A and B be two events defined on Ω and $P(B) > 0$ then $P(A|B) = \frac{P(A)}{P(B)}$.

- a) $B \subset A$ b) $A \cap B = \phi$ c) $A \subset B$ d) None of these

4) For two events A and B, if $P(A) = \frac{2}{3}$, $P(B) = \frac{3}{8}$ and $P(A \cap B) = \frac{1}{4}$ then A and B are

- a) Mutually exclusive but not independent
b) Mutually exclusive and independent
c) Independent but not mutually exclusive
d) Non mutually exclusive not independent

5) Which of the following is a probability distribution ?

- a) (0.2, 0.2, 0.7) b) (0.7, 0.2, 0.1)
c) (0.2, 0.1, 0.9) d) (0.1, 0.6, 0.2)

5. Answer **any five** of the following :

10

i) Define :

- a) Finite sample space
b) Uncountably finite sample space.

ii) Explain mutually exclusive events with an example.

iii) Define Axiomatic definition of probability.

iv) If A and B are mutually exclusive events, then prove that

- a) $P(\overline{A|B}) = 0$ b) $P(\overline{A|B}) = 0$

v) Define pair wise and mutual independence.

vi) Define conditional probability.

vii) Verify whether the following function is p.m.f. or not.

$$P(X = x) = \frac{1}{5}, \quad x = 0, 1, 2, 3, 4.$$



6. A) Answer **any two** of the following :

10

- i) With usual notation prove that $P(A \cup B) = P(A) + P(B) - P(A \cap B)$. Write the extension of the result to find $P(A \cup B \cup C)$.
- ii) If $P(A) = 0.5$, $P(B) = 0.6$ and $P(B|A) = 0.9$. Find the probability that
 - i) both A and B happen
 - ii) at least one of A and B happen
- iii) A man is equally likely to choose any one of the three routes A_1, A_2, A_3 from his house to the railway station. The probabilities of his missing the train by the routes A_1, A_2, A_3 are $\frac{2}{5}, \frac{3}{10}, \frac{1}{10}$ respectively. He sets out on a day and misses the train. What is the probability that the route A_3 was selected ?

B) Answer **any one** of the following :

10

- i) If A and B are independent events defined on sample space Ω . Then prove that
 - i) A and B^C are independent
 - ii) A^C and B are independent
 - ii) Given the following probability function of discrete r.v.X

X	:	0	1	2	3	4	5	6	7
P(x)	:	0	c	2c	2c	3c	c^2	$2c^2$	$7c^2+c$

 Find :
 - i) c
 - ii) Evaluate $P(X \geq 5)$
 - iii) $P(X < 3)$
 - iv) Distribution function of X
 - v) If $P(X \leq k) > \frac{1}{2}$ what is the minimum value of k, where k is positive integer.
-

Seat
No.

B.Sc. – I (Semester – I) (CGPA) (Old) Examination, 2017
MATHEMATICS (Paper – I)
Algebra and Calculus

Time : 2½ Hours

Max. Marks : 70

- Instructions:** 1) *All questions are compulsory.*
2) *Figure to the right indicates full marks.*
3) *Answer to the two Sections should be written in the separate answer books.*

SECTION – I (Algebra)

1. Select the correct alternative for **each** of the following :

5

1) If $A = \begin{bmatrix} 1 & 2 & 0 \\ 3 & -1 & 4 \end{bmatrix}$ then the matrix AA' is

a) $\begin{bmatrix} 1 & 2 \\ 3 & 0 \end{bmatrix}$

b) $\begin{bmatrix} 5 & 0 \\ 1 & 12 \end{bmatrix}$

c) $\begin{bmatrix} 3 & 1 \\ 1 & 14 \end{bmatrix}$

d) $\begin{bmatrix} 5 & 1 \\ 1 & 26 \end{bmatrix}$

2) The eigen values of matrix $\begin{bmatrix} 1 & 2 & 3 \\ 0 & 3 & 5 \\ 0 & 0 & 6 \end{bmatrix}$ are

a) 1, 2, 3

b) 1, 3, 6

c) 0, 3, 5

d) 0, 0, 6

3) Find the real value of $(i)^i$ is

a) $e^{\pi/2}$

b) $e^{-\pi/2}$

c) $e^{i\pi/2}$

d) $e^{-i\pi/2}$

4) For any complex number z , $\sin(iz) =$

a) $\sin z$

b) $i \sin z$

c) $i \sinh z$

d) $\sinh(iz)$

5) For any real θ , $e^{-i\theta}$ is

a) $\cos \theta - i \sin \theta$

b) $\cos \theta - i \sin(-\theta)$

c) $\cos \theta + i \sin \theta$

d) none of the above

P.T.O.



2. Attempt **any five** of the following :

10

1) Separate into real and imaginary part of $\cos(x + iy)$

2) If $x = \cos \theta + i \sin \theta$ then prove that $2 \cos \theta = x + \frac{1}{x}$.

3) If $\tan(\alpha + i\beta) = x + iy$ then prove that $\tanh(2\beta) = \frac{2y}{1+x^2+y^2}$.

4) Prove that $\cosh^2 z - \sinh^2 z = 1$.

5) Show that for square matrices A, B of the same order, $AB^T - BA^T$ is skew-symmetric.

6) Find the eigen value of matrix $\begin{bmatrix} 1 & 1 & 1 \\ 1 & 2 & 1 \\ 3 & 2 & 3 \end{bmatrix}$.

7) Solve : $x - y + z = 0$; $x + 2y - z = 0$; $2x + y + 3z = 0$.

3. Attempt **any two** of the following :

10

1) State and prove De Moivre's theorem.

2) Discuss the solution of the system of equations :

$$x + y + z = 6, \quad 2x + y + 3z = 13, \quad 5x + 2y + z = 12.$$

3) If z is any complex number then show that $\sinh^{-1} z = \log(z + \sqrt{z^2 + 1})$.

4. Attempt **any one** of the following :

10

1) i) If $\cos(\alpha + i\beta) = x + iy$ then prove that

$$\text{a) } \frac{x^2}{\cosh^2 \beta} + \frac{y^2}{\sinh^2 \beta} = 1 \quad \text{and} \quad \text{b) } \frac{x^2}{\cos^2 \alpha} - \frac{y^2}{\sin^2 \alpha} = 1$$

ii) Prove that $32 \cos^6 \theta = \cos 6\theta + 6 \cos 4\theta + 15 \cos 2\theta + 10$ by using De Moivre's theorem.

2) State and prove Cayley-Hamilton theorem and hence find the inverse of matrix

$$A = \begin{bmatrix} 1 & 2 & 2 \\ 2 & 1 & 2 \\ 2 & 2 & 1 \end{bmatrix}.$$



SECTION – II (Calculus)

2.1. Choose the correct one alternative for **each** of the following : 5

- 1) If $y = \log(5x + 2)$ then $y_3 =$
- a) $\frac{250}{(5x + 2)^3}$ b) $\frac{125}{(5x + 2)^3}$ c) $\frac{25}{(5x + 2)^2}$ d) $\frac{5}{(5x + 2)^4}$
- 2) The power series $x - \frac{x^3}{3!} + \frac{x^5}{5!} - \frac{x^7}{7!} + \dots \infty$ is the series expansion of
- a) e^x b) $\sin x$ c) $\cos x$ d) $\log(1 + x)$
- 3) $u = \frac{x^{1/2} + y^{1/2}}{x^{1/3} + y^{1/3}}$ is homogeneous function of degree
- a) $\frac{1}{2}$ b) $\frac{1}{3}$ c) $\frac{1}{6}$ d) $-\frac{1}{6}$
- 4) $\int_0^{\pi/2} \cos^5 x \, dx =$
- a) $\frac{\pi}{15}$ b) $\frac{2\pi}{15}$ c) $\frac{8}{15}$ d) $\frac{8\pi}{15}$
- 5) If $\vec{F} = x\hat{i} + y\hat{j} + z\hat{k}$ then $\text{curl } \vec{F} =$
- a) $\hat{i} + \hat{j} + \hat{k}$ b) $\hat{i} - \hat{j} + \hat{k}$ c) $\hat{i} + \hat{j} - \hat{k}$ d) $\vec{0}$

2.2. Answer **any five** of the following : 10

- i) Evaluate $\lim_{x \rightarrow 0} (a^x + x)^{1/x}$.
- ii) Obtain the series expansion of $\cos x$.
- iii) Examine the continuity at $(0, 0)$ of $f(x, y) = \frac{x^2}{x^2 + y^2 - 2x}$, $(x, y) \neq (0, 0)$
 $f(0, 0) = 0$.
- iv) If $u = \log(x^2 + y^2)$, prove that $\frac{\partial^2 u}{\partial x \partial y} = \frac{\partial^2 u}{\partial y \partial x}$.



v) Find $\int_0^1 \frac{x^5}{\sqrt{1-x^2}} dx$.

vi) Find the directional derivative of $\phi(x, y, z) = x^2yz + xy^2z + xyz^3$ at $(-1, 1, 1)$ in the direction of the vector $\hat{i} - \hat{j} - \hat{k}$.

vii) Find n^{th} derivative of $y = \cos^2x \cdot \sin x$.

2.3. Attempt **any two** of the following :

10

i) If $u = \log v$ and $v = x^3 - x^2y - xy^2 + y^3$, prove that

$$\frac{\partial u}{\partial x} + \frac{\partial u}{\partial y} = \frac{2}{x+y} \quad \text{and} \quad \frac{\partial^2 u}{\partial x^2} + 2 \frac{\partial^2 u}{\partial x \partial y} + \frac{\partial^2 u}{\partial y^2} = \frac{-4}{(x+y)^2}.$$

ii) Evaluate $\int_0^\infty \frac{x^2}{\sqrt{1+x^6}} dx$.

iii) If $\phi(x, y, z) = x^3 + y^3 + z^3 - 3xyz$, find $\text{div}(\text{grad } \phi)$ and $\text{curl}(\text{grad } \phi)$.

2.4. Attempt **any one** of the following :

10

i) State and prove Leibnitz's theorem. Hence if $y = e^{m \cos^{-1} x}$, prove that

$$(1-x^2)y_{n+2} - (2n+1)y_{n+1} - (n^2 + m^2)y_n = 0.$$

ii) State and prove Euler's theorem on homogeneous function $f(x, y)$. Hence

verify it for the function $u = \frac{x^{1/3} + y^{1/3}}{x^{1/2} + y^{1/2}}$.



2. Answer **any five** of the following : **10**
- i) Determine the value of a given resistor having the colour code of brown, black, brown and silver in order.
 - ii) State h-parameters with their units.
 - iii) Give the classification of capacitors.
 - iv) Define the terms active network and passive network.
 - v) Define the terms time period and frequency.
 - vi) State Kirchhoff's current law.
 - vii) State Norton's theorem.
3. A) Write short notes on **any two** of the following : **10**
- i) Constant current source and constant voltage source.
 - ii) Thevenin's theorem.
 - iii) Admittance (Y) parameters.
- B) Answer **any one** of the following : **10**
- i) Explain colour code of a resistor. Explain procedure to obtain value of resistor with suitable example.
 - ii) Explain series LCR circuit. Obtain an expression for resonant frequency.

SECTION – II
(Digital Fundamentals)

4. Select correct alternative for the following : **5**
- 1) The base of decimal number system is _____
a) 2 b) 8 c) 16 d) 10
 - 2) IC 7402 is _____ gate.
a) OR b) AND c) NOR d) EX-OR
 - 3) Half adder adds _____ bits at a time.
a) 2 b) 3 c) 4 d) 5
 - 4) $A \cdot \bar{A} =$ _____
a) A b) \bar{A} c) 0 d) 1
 - 5) The excess 3 code of decimal number $(5)_{10}$ is _____
a) 1000 b) 1010 c) 1001 d) 1100



5. Answer **any five** of the following : **10**
- i) State truth table for OR gate.
 - ii) Draw pin diagram of IC 7408.
 - iii) Show that $A + AB = A$.
 - iv) Solve $(1001)_2 + (0100)_2$.
 - v) Draw logic diagram of half adder.
 - vi) Explain 2's complement of a binary number with suitable example.
 - vii) What is negative logic ?
6. A) Write short notes on **any two** of the following : **10**
- i) Half subtracter
 - ii) NAND gate as a universal block
 - iii) Gray code.
- B) Answer **any one** of the following : **10**
- i) State and prove both De-Morgan's theorems.
 - ii) Explain block diagram of digital computer.
-



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B.Sc. – I (Semester – I) (CGPA) (Old) Examination, 2017
COMPUTER SCIENCE (Paper – I)
Computer Fundamentals and Programming Using ‘C’ – I

Time : 2½ Hours

Max. Marks : 70

- N.B :*** 1) ***All questions are compulsory.***
2) ***Figures to the right indicate full marks.***

SECTION – I
(Computer Fundamentals)

1. Multiple choice questions : 5
- 1) The brain of any computer system is
 - a) ALU
 - b) Memory
 - c) CPU
 - d) Control Unit
 - 2) Which of the following is the 1's complement of 10 ?
 - a) 01
 - b) 110
 - c) 11
 - d) 10
 - 3) Which device of computer operation dispenses with the use of the keyboard ?
 - a) Joystick
 - b) Light pen
 - c) Mouse
 - d) Touch
 - 4) Which printer uses a combination of laser-beam and electro photographic techniques ?
 - a) Laser printers
 - b) Dot-matrix
 - c) Line printer
 - d) Daisy wheel
 - 5) A compiler means
 - a) A person who compiles source programs
 - b) The same thing as a programmer
 - c) Keypunch operator
 - d) A program which translates source program into object program



2. Answer **any five** of the following : 10
- 1) Define Computer.
 - 2) Define Bit, Byte.
 - 3) Convert the hexadecimal number A62 to binary number.
 - 4) Explain single user operating system.
 - 5) Find the one's complement of 1011.
 - 6) What is EPROM ?
 - 7) What is compiler ?
3. A) Write short notes on **any two** of following : 10
- 1) Explain the block diagram of computer.
 - 2) Explain the functions of operating system.
 - 3) Explain laser printer in detail.
- B) Answer **any one** of the following : 10
- 1) Convert the following :
 - a) $(10101)_2 = (?)_8$
 - b) $(156)_{10} = (?)_{16}$
 - c) $(578.23)_8 = (?)_{10}$
 - d) $(4DF)_{16} = (?)_2$
 - e) $(23.56)_{10} = (?)_8$
 - 2) Explain the different generations of computer in detail.

SECTION – II
(Programming Using C – I)

1. Multiple choice questions : 5
- 1) _____ is not keyword in 'C' language.
a) void b) main c) else d) for
 - 2) Total number of keywords in 'C' language are
a) 30 b) 32 c) 48 d) 132
 - 3) Break statement is used for
a) Quit a program b) Quit the current iteration
c) Both of above d) None of above



- 4) Range of char data type is
a) +127 to -128 b) - 127 to 128 c) 128 to - 127 d) - 128 to 127
- 5) Printf() and scanf() contains in _____ header file.
a) conio.h b) std.h c) stdio.h d) iostream.h

2. Answer **any five** of the following : **10**

- 1) Write syntax of if-else statement.
- 2) Give any two string functions syntax and its purpose.
- 3) Define keyword.
- 4) Write goto statement syntax.
- 5) What is array ?
- 6) Define variable and constant.
- 7) Gives the syntax of two entry controlled loop in 'c' language.

3. A) Write short notes on **any two** of the following : **10**

- 1) What is flowchart ? Explain different shapes of flowchart with one example.
- 2) Write a program to check number is Armstrong or not.
- 3) Explain nested while loop with example.

B) Answer **any one** of the following : **10**

- 1) Explain algorithm and its characteristics and give one example of it.
 - 2) Write a program to calculate addition of (2 * 2) matrix.
-



2. Answer **any five** of the following : **10**
- 1) What is metamorphism ?
 - 2) Mention major types of rock.
 - 3) Give the names of earthquake waves.
 - 4) Define the term of geomorphology.
 - 5) What is folding ?
 - 6) What is faulting ?
 - 7) What is earthquake ?
3. Write short notes on **any two** of the following : **10**
- 1) Nature and scope of geomorphology.
 - 2) Describe the types of faults.
 - 3) What is igneous rock ? Describe their types and characteristics.
4. Answer **any one** of the following : **10**
- 1) Describe any two theories of the origin of the earth.
 - 2) Explain the causes and effects of earthquake and its world distribution.

SECTION – II

1. Choose the correct alternative and rewrite : **5**
- 1) Pot holes are the landforms of
a) River b) Wind c) Glacier d) Karst topography
 - 2) The concept of geomorphic cycle of erosion was postulated by
a) W. M. Davis b) Walter Rock c) King d) Crikmay
 - 3) Laterite soil is formed due to
a) Deposition of loess b) Denudation
c) Deposition of alluvial d) None of these
 - 4) _____ is the reaction of carbonate ions with minerals.
a) Carbonation b) Hydration c) Oxidation d) Solution
 - 5) The term weathering means
a) Decay b) Erosion c) Deposition d) Transportation



2. Answer **any five** of the following : **10**
- 1) What is mechanical weathering ?
 - 2) What do you mean by the cycle of erosion ?
 - 3) What is soil ?
 - 4) What is chemical weathering ?
 - 5) What is N.P.K. of soils ?
 - 6) What is T.S.S. of soils ?
 - 7) State the two factors affecting of weathering.
3. Write short notes on **any two** of the following : **10**
- 1) Wind erosional landforms.
 - 2) State the types of physical weathering.
 - 3) Give the process of formation of soil.
4. Answer **any one** of the following : **10**
- 1) Describe briefly the work of river as an agent of erosion, transportation and deposition.
 - 2) Describe major landforms produced by wind erosion.
-



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B.Sc. (Part – I) (Semester – I) (CGPA) (Old) Examination, 2017
ZOOLOGY (Paper – I)
Animal Diversity – I, Cell Biology and Genetics

Time : 2.30 Hours

Max. Marks : 70

- N.B. :** 1) **Draw** neat labelled diagram **wherever** necessary.
2) Figures to the **right** indicate **full** marks.
3) **Two** Sections should be written in **separate** answer book.

SECTION – I
(Animal Diversity – I)

1. Rewrite the following sentences choosing correct alternative given below : 5
- 1) Earthworm belongs to phylum _____
 - a) Porifera
 - b) Platyhelminthes
 - c) Annelida
 - d) Coelenterata
 - 2) A sexual reproduction in Hydra is called as _____
 - a) Conjugation
 - b) Budding
 - c) Binary fission
 - d) Plasmogamy
 - 3) Tapeworm requires _____ hosts to complete its life cycle.
 - a) 2
 - b) 3
 - c) 4
 - d) 5
 - 4) In earthworm spermathecae stores _____
 - a) Eggs
 - b) Sperms
 - c) Female gametes
 - d) Ova
 - 5) In case of Sycon _____ cells are called to tipotent cells.
 - a) Choanocyte
 - b) Mesocyte
 - c) Archaeocyte
 - d) Porocyte
2. Answer **any five** of the following : 10
- i) Salient features of Coelenterata.
 - ii) Setae of earthworm.
 - iii) A sexual reproduction in Hydra.



- iv) Scolex of tapeworm.
- v) Binary fission in Paramecium.
- vi) Spermatheca of earthworm.
- vii) Archaeocytes of sycon.

3. A) Write short notes on **any two** of the following : 10
- i) Describe the structure and functions of contractile vacuole in Paramecium.
 - ii) Describe physiological adaptations found in tapeworm.
 - iii) Describe the septal nephridium of earthworm.
- B) Answer **any one** of the following : 10
- i) Describe different types of locomotions found in Hydra.
 - ii) Describe the digestive system of earthworm.

SECTION – II
(Cell Biology and Genetics)

1. Rewrite the following sentences choosing correct alternative be given below : 5
- 1) Cell organelle concerned with synthesis of protein is _____
- a) Golgi complex
 - b) Lysosomes
 - c) Ribosomes
 - d) Mitochondrion
- 2) In partial dominance, phenotypic ratio is _____
- a) 1 : 2 : 1
 - b) 3 : 1
 - c) 2 : 1 : 1
 - d) 1 : 1 : 2
- 3) Fluid mosaic model is discovered by _____
- a) Singer and Nicolson
 - b) Gorter and Grendel
 - c) Watson and Crick
 - d) Robertson
- 4) XX – XY type of sex determination is found in _____
- a) Fishes and reptiles
 - b) Man
 - c) Moth
 - d) Butterfly
- 5) _____ is wild type of coat colour in rabbit.
- a) Agouti
 - b) Chinchilla
 - c) Himalayan
 - d) Albino



2. Answer **any five** of the following : **10**
- i) Nucleolus
 - ii) Monohybrid cross
 - iii) Structure of Ribosome
 - iv) Passive transport
 - v) PKU
 - vi) Endoplasmic reticulum
 - vii) Chromosome.
3. A) Write short notes on **any two** of the following : **10**
- i) Describe co-dominance with suitable example.
 - ii) Sickle cell anaemia
 - iii) Describe the structure and functions of Mitochondria.
- B) Answer **any one** of the following : **10**
- i) Describe the ABO blood groups in human with Rh factor.
 - ii) Explain the structures and functions of Golgi complex.
-



2. Answer **any five** of the following 10
- i) What is Mycoplasma ?
 - ii) What is phycology or algology ?
 - iii) Which algae are used as biofertilizers.
 - iv) What is bacteria ?
 - v) Sketch and label the bacteriophage virus.
 - vi) Give systematic position of Nostoc.
 - vii) Give any four economic importance of Lichens.
3. A) Answer **any two** of the following : 10
- i) Describe the lateral conjugation in spirogyra.
 - ii) Give economic importance of algae.
 - iii) Give occurrence, structure of mycelium and nutrition in Mucor.
- B) Answer **any one** of the following : 10
- i) Give an account of sexual reproduction in Riccia.
 - ii) Give occurrence, external morphology of sporophyte (plant body) and T.S. of stem in Selaginella.

SECTION – II
(Plant Physiology and Horticulture)

1. Rewrite the following sentences by choosing correct alternatives. 5
- 1) The branch of horticulture which deals with cultivation, processing and marketing of flowering plants is called
- a) olericulture b) pomoculture
 - c) ornamental d) floriculture
- 2) _____ is a natural method of vegetative propagation.
- a) Runner b) Cutting c) Layering d) Budding
- 3) _____ is an example of co-factor.
- a) ATP b) Mg c) FAD d) NAD



- 4) _____ phase, the growth of rate is rapid to maximum.
a) Cell division b) Log c) Lag d) Steady
- 5) The elements are required for growth and development of plant in less amount, which are known as
a) Macro elements b) Micro elements
c) Both a and b d) Trace element

2. Answer **any five** of the following : **10**

- i) Define photoperiodism.
- ii) Primary structure of enzyme.
- iii) What are growth promoters ?
- iv) Enlist the micro nutrients.
- v) Enlist the branches of horticulture.
- vi) What are suckers ?
- vii) What is meant by grafting ?

3. A) Write short notes on **any two** of the following : **10**

- i) Define vernalization and its mechanism.
- ii) Explain air layering with suitable example.
- iii) Role and deficiency symptoms of N and Mg.

B) Answer **any one** of the following : **10**

- i) Define horticulture and describe scope of horticulture.
 - ii) Define growth hormone, describe the practical applications of Auxin and CCC.
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B.Sc. – I (Semester – I) (CGPA) (Old) Examination, 2017
GEOLOGY (Paper – I)
Mineralogy and Palaeontology and Igneous, Sedimentary and
Metamorphic Petrology

Time : 2 ½ Hours

Max. Marks : 70

- Instructions :** 1) **All questions are compulsory.**
2) **Figures to the right indicate full marks.**
3) **Draw neat labelled diagrams wherever necessary.**
4) **Answer to both Sections should be written in separate answer book.**

SECTION – I

(Mineralogy and Palaeontology)

1. Fill in the blanks with correct answer from given options :

5

- 1) Chemical composition of Quartz is _____
a) SiO_2 b) SiO_4 c) AlSiO_5 d) FeO
- 2) Micraster belongs to _____ class.
a) Lamellibranchia b) Cephalopoda
c) Trilobite d) Echinoidea
- 3) The _____ is the best example of preservation of entire organism.
a) Woolly mammoth b) Fish skeleton
c) Coal d) Leaf impression
- 4) All the minerals in mica group show _____ lustre.
a) Vitreous b) Pearly
c) Adamantine d) Dull
- 5) Mineral Asbestos shows _____ form.
a) Foliated b) Drusy c) Bladed d) Fibrous



2. Answer **any five** of the following : 10
- 1) Define fossils.
 - 2) Describe any two forms of minerals with neat sketches.
 - 3) Draw a figure of ionic bonds in minerals.
 - 4) What are trace fossils ?
 - 5) Describe Physical properties and chemical composition of orthoclase.
 - 6) Describe Imprints.
 - 7) Name any two species belonging to Brachiopoda phylum.
3. A) Write short notes on **any two** of the following : 10
- 1) Describe types of luster.
 - 2) Types of aperture in gastropods.
 - 3) Describe members, chemical composition and physical properties of Pyroxene group minerals.
- B) Answer **any one** of the following : 10
- 1) Define mineral. Describe feldspar group of minerals.
 - 2) Describe morphology of hard parts of trilobites.

SECTION – II

(Igneous, Sedimentary and Metamorphic Petrology)

1. Fill in the blanks with correct answer from given options : 5
- 1) _____ is a discordant intrusions in unfolded region.
a) Dyke b) Batholith c) Boss d) Stock
 - 2) The gaseous and vapors entrapped during the solidification of lava form _____ structure.
a) Flow b) Ropy c) Pillow d) Vesicular
 - 3) Arenaceous sedimentary rocks composed entirely of _____ grains.
a) Sand b) Clay c) Boulder d) Cobble



- 4) _____ are typical argillaceous rocks.
a) Conglomerate and Breccia b) Shale and mudstone
c) Laterite and Bauxite d) Grit and Sandstone
- 5) _____ is a dark coloured exceedingly fine grained low grade Cataclastic metamorphic rock.
a) Slate b) Quartzite c) Marble d) Hornblende Schist

2. Answer **any five** of the following : **10**

- 1) What is extrusive igneous rocks ?
- 2) Name the concordant igneous intrusions.
- 3) Cementing material.
- 4) Clastic sediments.
- 5) Slaty structure.
- 6) Antistress mineral
- 7) Schist structure.

3. A) Answer **any two** of the following : **10**

- 1) Describe composition of magma.
- 2) Explain the process of sedimentary rock formation.
- 3) Explain depth zones.

B) Answer **any one** of the following : **10**

- 1) Explain any four sedimentary structure.
 - 2) Explain subdivisions of petrology in detail.
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B.Sc. I (Semester – I) (CGPA) (Old) Examination, 2017
MICROBIOLOGY (Paper – I)
Fundamentals of Microbiology and Microbial Techniques

Time : 2½ Hours

Max. Marks : 70

- N.B. :** 1) *All questions are compulsory.*
2) *Figures to the right indicates full marks.*
3) *Answers to the two Sections should be written in the separate answer books.*

SECTION – I
(Fundamentals of Microbiology)

1. Rewrite the following sentences by selecting correct answers from given alternatives :

5

- 1) _____ protein is present in bacterial flagella.
a) Pilin b) Albumin c) Flagellin d) Peptidoglycan
- 2) _____ are obligatory intracellular parasites.
a) Bacteria b) Protozoa c) Fungi d) Viruses
- 3) Penicillin antibiotic is discovered by
a) Louis Pasteur b) Alexander Flemming
c) Joseph Lister d) John Tyndall
- 4) Cocci are _____ shaped bacteria.
a) Rod b) Round c) Spiral d) Coma
- 5) Ribosomes in procaryotic cells are _____ type.
a) 80s b) 70s c) 50s d) 40s



2. Answer **any five** of the following : 10
- i) Define species
 - ii) Define viruses
 - iii) Define mycology
 - iv) Define monotrichous flagella
 - v) Define pasturisation
 - vi) Give two functions of cell membrane
 - vii) Give two characteristics of procaryotic cell.
3. A) Write short notes on **any two** of the following : 10
- i) Criteria for bacterial classification.
 - ii) Contributions of Louis Pasteur.
 - iii) General characteristics of Fungi.
- B) Answer **any one** of the following : 10
- i) Describe in detail cell wall of bacteria.
 - ii) Describe in detail structure and general characteristics of viruses.

SECTION – II

(Microbial Techniques)

1. Rewrite the following sentences by selecting correct answers from given alternatives : 5
- 1) _____ is used as mordant in Gram staining.
a) Alcohol b) Gram's Iodine c) Safranine d) Crystal violet
 - 2) _____ requires living media for cultivation.
a) Viruses b) Bacteria c) Fungi d) Algae
 - 3) _____ objective lens is used for observation of bacteria.
a) 10 X b) 45 X c) 40 X d) 100 X
 - 4) Heat sensitive liquid media are sterilized by
a) Autoclave b) Hot air oven c) Filtration d) Boiling
 - 5) _____ is an example of living media.
a) Embryonated egg b) Nutrient agar
c) Peptone water d) MacConkey's agar



2. Answer **any five** of the following : **10**
- i) Define sterilization.
 - ii) Define stains.
 - iii) Define magnification of image.
 - iv) Define Antiseptic.
 - v) Define selective media.
 - vi) Stains used in cell wall staining.
 - vii) Two names of gaseous sterilizing agents.
3. A) Write short notes on **any two** of the following : **10**
- i) Sterilization by autoclave.
 - ii) Compound microscope.
 - iii) Sterilization by chemical agents.
- B) Answer **any one** of the following : **10**
- i) Describe in detail methods of pure culture techniques.
 - ii) Describe in detail Gram staining.
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B.Sc. – I (Semester – II) (CBCS) (New) Examination, 2017
ENGLISH (Comp.)
On Track : English Skills for Success

Time : 2½ Hours

Max. Marks : 70

1. Complete the following sentences by choosing the correct alternatives from those given below them :

14

- 1) The V-2 missile became the first missile to exceed the
 - a) speed of motor
 - b) speed of sound
 - c) speed of computer
 - d) none
- 2) _____ is the denominator among all successful men and women.
 - a) Partial interest
 - b) Total discipline
 - c) Total commitment
 - d) Partial commitment
- 3) The Parliament of Religions was to be held in
 - a) America
 - b) Canada
 - c) Singapore
 - d) India
- 4) Who represented the Jains at the Parliament of Religions ?
 - a) Swami Vivekananda
 - b) Annie Besant
 - c) Gandhi
 - d) Pratap Chunder Mozoomdar
- 5) According to Nani A. Palkhivala human rights may be summed up in one word
 - a) survival
 - b) fraternity
 - c) freedom
 - d) none
- 6) The main reason for serious economic problems of the majority is
 - a) famine
 - b) negligence
 - c) drought
 - d) ignorance
- 7) Nani A. Palkhivala's ultimate aim was to establish _____ as a social mandate.
 - a) Dharma
 - b) Constitution
 - c) Secularism
 - d) None



- 8) Ralph Emerson's 'Brahma' speaks about the relationship between
- the soul and surrounding world
 - the body and surrounding world
 - the soul and body
 - the poet and soul
- 9) Robert Hayden _____ mankind's relationship with the moon.
- ponders on
 - rejects
 - prays
 - none
- 10) Ralph Emerson is an advocate of
- transcendentalism
 - all religions
 - west philosophy
 - none
- 11) That is the _____ important thing of all for Kisan.
- list
 - least
 - lest
 - little
- 12) The _____ congratulated the best student of the college.
- principle
 - principal
 - prencipal
 - principles
- 13) Mr. Kokane cannot drink _____ coffee without your company.
- her
 - his
 - their
 - your
- 14) The correct antonym of 'expensive' is
- cheap
 - chief
 - poor
 - best

2. Answer in brief **any seven** of the following :

14

- 1) What happened to the first V-2 missile when it was first tested ?
- 2) What is 'flow' according to Dr. A. P. J. Abdul Kalam ?
- 3) Describe Vivekananda's meeting with J. H. Wright.
- 4) What kind of personality was Wernher von Braun according to Dr. Kalam ?
- 5) How was Vivekananda's speech at the Parliament of Religions different from those of the other speakers ?
- 6) Why does Palkhivala say that the world continues to be 'less than half free' ?
- 7) Enumerate the signs of hope for a better world that Palkhivala sees.
- 8) How did Vivekananda begin his speech in Parliament of religion ?



3. A) Write short answers on **any two** of the following : **8**
- 1) What is the message of the poem 'Brahma' by Emerson ?
 - 2) How does Hayden Lament the Moon's Fate ?
 - 3) What is Emerson's concept of 'Brahma' ?
- B) Write short answers on **any two** of the following : **6**
- 1) As the Principal of college, write a notice informing students about Annual Social Gathering. Mention day, date and events.
 - 2) What is an agenda ?
 - 3) What do you mean by minutes ?
4. Answer **any one** of the following questions : **14**
- A) You are Dr. Tanaji Bhand, Secretary of Prabodhan Academy. The well known speaker has been called to deliver lecture on M.P.S.C. examinations. Write a notice and agenda informing members of the academy. Imagine necessary details.
- OR
- B) You have received an email letter of appointment for the post of Assistant Manager at Spark Consulting Company, Pune. Write an email letter accepting the offer.
5. Prepare the curriculum vitae of a science graduate who has applied for the post Sales Executive. **14**
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B.Sc. (Part – I) (Semester – II) Examination, 2017
(New CBCS Pattern)
CHEMISTRY
Organic Chemistry (Paper – III)

Time : 2½ Hours

Total Marks : 70

- Instructions:** 1) **All questions are compulsory.**
2) **Draw neat diagram and give equations wherever necessary.**
3) **Figures to the right indicate full marks.**

1. Choose the most correct alternative for the following and rewrite the sentences : **14**

- i) Carbenes are _____
a) Monovalent b) Divalent c) Trivalent d) Tetravalent
- ii) Total number of bonds present in $\text{HC} \equiv \text{CH}$ are _____
a) 1σ and 4π b) 2σ and 3π
c) 3σ and 2π d) 4σ and 1π
- iii) Benzynes are the aromatic compounds containing a formal _____ bond.
a) One triple b) Two triple
c) Three triple d) Four triple
- iv) The % of s character in sp^2 hybrid orbital is _____ %.
a) 25 b) 33 c) 50 d) 60
- v) The number of electrons in outermost valence shell of carbon free radicals are _____
a) 6 b) 4 c) 8 d) 7
- vi) Hyperconjugation effect involves the delocalization of _____
a) σ electrons b) π electrons
c) σ and π electrons d) Lone pair of electrons
- vii) The general formula of cycloalkane is _____
a) $\text{C}_n\text{H}_{2n+2}$ b) C_nH_{2n} c) $\text{C}_n\text{H}_{2n-2}$ d) C_nH_{3n}



- viii) Maleic acid and Fumaric acid are _____
a) Geometrical isomers b) Enantiomers
c) Optical isomers d) Distereoisomers
- ix) Acidic hydrogens are present in _____
a) Ethane b) Ethene c) Ethyne d) Benzene
- x) Aromaticity can be explained on the basis of _____ rule.
a) Hund's b) Phase c) Huckel's d) Van't Hoff
- xi) 1,4-Pentadiene is an example of _____ diene.
a) Isolated b) Conjugated c) Cumulated d) None of these
- xii) Nitration of benzene is carried with _____
a) Con.HNO₃ b) Con.H₂SO₄
c) Con.HNO₃ + Con.H₂SO₄ d) dil.HNO₃
- xiii) Olefins can be hydrogenated by _____
a) Zn/HCl b) H₂/Ni
c) Nascent H₂ d) LiAlH₄ in ether
- xiv) Pyridine is _____ compound.
a) Aromatic b) Non-aromatic
c) Anti-aromatic d) Pseudo aromatic

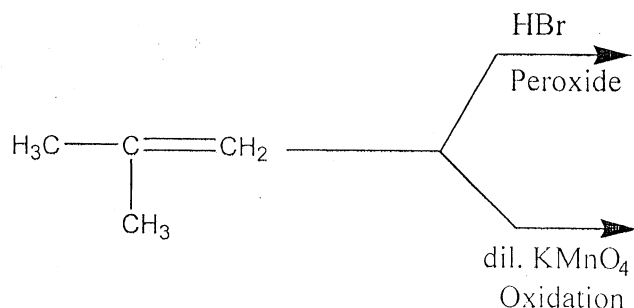
2. Attempt **any seven** of the following :

14

- i) Define the terms :
a) Homolytic fission
b) Heterolytic fission.
- ii) Explain Nitrene intermediate.
- iii) Define the terms :
a) Bond angle
b) Bond energy.
- iv) Draw the resonating structures of nitrobenzene.
- v) What is the action of the following on cyclopropane ?
a) Con.HBr
b) H₂/Ni.



vi) Predict the products for the following reaction :



vii) Define Diels-Alder reaction with suitable example.

viii) Why are meso compounds optically inactive ?

ix) Define the terms :

- a) Non-aromatic compounds.
- b) Anti-aromatic compounds.

3. A) Attempt **any two** of the following : 10

- i) Discuss the mechanism involved in sulphonation of benzene.
- ii) Explain the optical isomerism in case of Lactic acid.
- iii) Explain the reaction and mechanism involved in dehydration of lower alcohols.

B) Discuss the free radical mechanism for the chlorination of methane. 4

4. Attempt **any two** of the following : 14

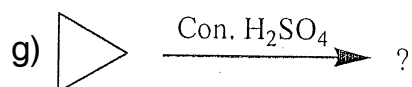
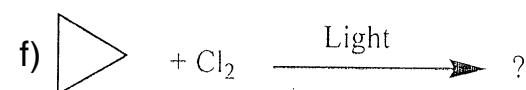
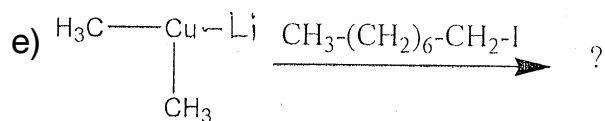
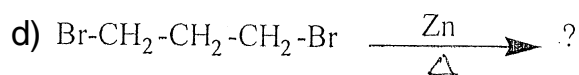
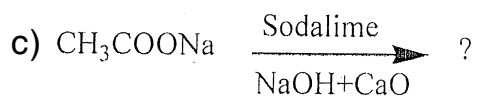
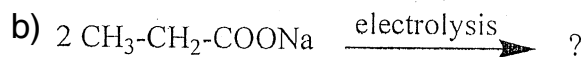
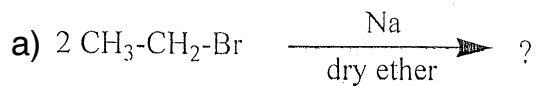
- i) Explain the following terms with reactions :
 - a) Hydroboration for ethylene
 - b) Polymerization of ethylene
 - c) Saytzeff rule for dehydrohalogenation.
- ii) Discuss the following terms :
 - a) Hyperconjugation effect w.r.t. Toluene
 - b) Steric effect w.r.t. Mesitoic acid.
- iii) What are reagents ? Explain the different types of reagents with suitable examples.



5. Attempt **any two** of the following :

14

i) Complete the following reactions :



ii) Discuss the optical isomerism of 2,3-dihydroxy butanoic acid.

iii) Discuss the mechanism involved in :

a) Friedel-Crafts alkylation

b) Nitration of benzene.



- 8) _____ water is suitable for industrial and steam generation purpose.
a) Hard b) Soft c) Chlorinated d) Temporary
- 9) A dibasic acid has molecular weight 196 then its equivalent weight is
a) 196 b) 49 c) 98 d) 108
- 10) The ratio of velocity of light in vacuum to that in the medium is called
a) Viscosity b) Dipole moment
c) Refractive index d) Surface tension
- 11) All ions from water is removed by
a) Ion exchange b) Zeolite
c) Soda ash d) Lime soda
- 12) The conversion of n-heptane to toluene is
a) Knocking b) Hydroforming
c) Cracking d) None of these
- 13) CO_2 and CS_2 has zero dipole moment hence their expected structures is
a) Non-linear b) Angular c) Linear d) Spherical
- 14) _____ is used in the manufacture of synthetic rubber.
a) 2-phenyl ethanol b) Styrene
c) Adipic acid d) Paracetamol

2. Answer **any seven** of the following :

14

- 1) Define (i) empirical formula (ii) molecular formula.
- 2) Write the equations to calculate (i) specific refractivity (ii) molecular refractivity.
- 3) Define (i) pollutant (ii) threshold limit value.
- 4) Define (i) Constitutive property (ii) Fluidity.
- 5) What do you understand biological oxygen demand ?
- 6) Give the synthesis of 2-phenyl ethanol.
- 7) What is meant by potable water ? What are the resources of water ?
- 8) Draw neat labelled diagram of Liebig's method for estimation of carbon and hydrogen.
- 9) Define parachor and write Macleod's equation.



3. A) Answer **any two** of the following : **10**
- 1) Define coefficient of viscosity. How it is determined by Ostwald method ?
 - 2) Discuss chemical methods for removal of germs and bacteria from water.
 - 3) Write short note on refining of petroleum.
- B) Explain types of pollution. **4**
4. Answer **any two** of following : **14**
- 1) Explain the use of dipole moment in the study of molecular structure.
 - 2) Discuss sources and health effects of carbon monoxide and oxides of sulphur.
 - 3) Discuss the principle involved in the qualitative analysis of halogen by Carius method. 2.59×10^{-4} kg of organic compound gave 1.78×10^{-4} kg of AgCl in Carius estimation. Find the percentage of chlorine in the organic compound.
5. Answer **any two** of following : **14**
- 1) Define surface tension. Describe the method of determination of surface tension by drop-weight method.
 - 2) Explain types of water pollutants.
 - 3) An organic compound (molecular weight = 180) contains 38.94% of carbon and 6.72% of hydrogen, find its molecular formula.
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B.Sc. – I (Semester – II) (CBCS) (New) Examination, 2017
PHYSICS (Paper – III)
Heat and Thermodynamics

Time : 2½ Hours

Max. Marks : 70

- Instructions :** 1) **All questions are compulsory.**
2) **Figures to the right indicate full marks.**
3) **Draw neat diagrams wherever necessary.**
4) **Use of calculator/logarithmic table is allowed.**

1. Select Correct alternative :

14

- i) Lambda point temperature for liquid helium is about
a) 4.2 °K b) 10 °K c) 2.19 °K d) 0.4 °K
- ii) The zeroth law of thermodynamics leads to definition of the term
a) Entropy b) Pressure c) Volume d) Temperature
- iii) Viscosity of a gas is due to transport of
a) Momentum b) Energy c) Mass d) None of these
- iv) Any device which converts heat into mechanical work is called
a) Refrigerator b) Heat engine c) Air conditioner d) Cycle
- v) In Joule-Thomson cooling, the gas is allowed to escape through porous plug from
a) Low pressure to high pressure
b) High pressure to low pressure
c) Constant pressure region
d) None of these
- vi) All natural processes are
a) Reversible b) Irreversible c) Isothermal d) Adiabatic



- vii) In case of refrigerator coefficient of performance can be
- a) Less than 100%
 - b) Zero
 - c) Higher than 100%
 - d) None of these
- viii) The mean free path of gas molecules is inversely proportional to
- a) Square of the diameter of the molecule
 - b) Square root of the diameter of the molecule
 - c) Molecular diameter
 - d) Three fourth of the molecular diameter
- ix) Cooling by adiabatic demagnetisation of paramagnetic substance is also known as
- a) Paramagnetic effect
 - b) Magneto caloric effect
 - c) Mechano caloric effect
 - d) Regenerative cooling
- x) In practice the compression ratio in diesel engine is
- a) Less than 10
 - b) Equal to zero
 - c) Unity
 - d) In the range 15 to 20
- xi) In refrigerator heat flows from
- a) Sink to source
 - b) Source to sink
 - c) Atmosphere to sink
 - d) Atmosphere to source
- xii) The efficiency of Carnot's engine is 0.35. If the temperature of source is 500°K , then the temperature of the sink is
- a) 325°K
 - b) 175°K
 - c) 400°K
 - d) 250°K
- xiii) According to third law of thermodynamics, the heat capacities of all solids tend to _____ as absolute zero of temperature is approached.
- a) Zero
 - b) Unity
 - c) Infinity
 - d) Integer
- xiv) If a gas has specific heat at constant volume, $C_v = 2.5 \times 10^3 \text{ J/kg }^{\circ}\text{K}$ and coefficient of viscosity, $\eta = 3.2 \times 10^{-5} \text{ Ns/m}^2$, then it has the thermal conductivity, $K =$
- a) $8 \times 10^{-2} \text{ J/m.s }^{\circ}\text{K}$
 - b) $0.78 \times 10^{-2} \text{ J/m.s }^{\circ}\text{K}$
 - c) $1.28 \times 10^{-2} \text{ J/m.s }^{\circ}\text{K}$
 - d) $5.7 \times 10^{-2} \text{ J/m.s }^{\circ}\text{K}$

2. Answer **any seven** of the following :

14

- 1) State any two properties of liquid helium II.
- 2) Distinguish between otto engine and diesel engine.
- 3) Give applications of air conditioning system.



- 4) What do you mean by collision cross-section ?
 - 5) What is regenerative cooling ?
 - 6) Write general principle of refrigerator.
 - 7) How viscosity of a gas depends upon temperature and pressure ?
 - 8) Heat of 2 kcal is conducted from a body at 227 °C to another body at 127 °C. Find increase in entropy.
3. A) Attempt **any two** of the following : **10**
- 1) Describe experimental set up for adiabatic demagnetisation of paramagnetic substance.
 - 2) Obtain an expression for coefficient of thermal conductivity of a gas.
 - 3) Explain with examples, reversible and irreversible processes.
- B) Obtain an expression for work done during an isothermal process. **4**
4. Attempt **any two** of the following : **14**
- 1) Explain with neat diagram Linde's air liquifier.
 - 2) With neat diagram, describe the working of vapour compression refrigeration system.
 - 3) Determine the mean free path of gas molecules having average velocity of 800 m/s and coefficient of viscosity 3.5×10^{-4} Ns/m². Also calculate specific heat at constant volume if thermal conductivity is 7×10^{-2} J/ms °K.
(Density of the gas = 2 kg/m³)
5. Attempt **any one** of the following : **14**
- 1) What is adiabatic process ? Derive adiabatic relations.
A certain mass of gas at NTP is expanded to three times its volume under adiabatic conditions. Calculate the final temperature of the gas ($\gamma = 1.4$)
 - 2) What is otto cycle ?. With the help of P-V diagram, obtain an expression for efficiency of otto engine.
The efficiency of Carnot's engine is 40%. If the engine absorbs 60 cal of heat then how much heat is rejected ?
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B.Sc. – I (Semester – II) (CBCS Pattern) (New) Examination, 2017
PHYSICS (Paper – IV)
Electricity, Magnetism and Basic Electronics

Time : 2½ Hours

Max. Marks : 70

- Instructions :** 1) **All questions are compulsory.**
2) **Figures to the right indicate full marks.**
3) **Draw neat diagrams wherever necessary.**
4) **Use of calculator and log tables is allowed.**

1. Select the correct alternative :

14

- i) The time constant of a circuit consisting of a resistance of 50 ohm in series with an inductance of 5 henry is _____
a) 10 sec b) 0.1 sec c) 1 sec d) 250 sec
- ii) The charging of capacitor through inductor is _____
a) Exponential b) Linear
c) Oscillatory d) Sinusoidal
- iii) The time constant of the circuit containing resistance (R) and capacitor (C); connected to a source of steady e.m.f. is $T =$ _____
a) RC b) $\frac{R}{C}$ c) R^2C d) $R + C$
- iv) Multiplication of a vector by an operator j rotates the vector through _____ degrees in anticlockwise direction.
a) 45 b) 90 c) 180 d) 360
- v) The expression for quality factor in case of series resonant circuit is $Q =$ _____
a) $\omega_0 L$ b) $\omega_0 C$ c) $\frac{\omega_0 L}{R}$ d) $\omega_0 LR$
- vi) Impedance (Z) of a parallel LCR circuit at resonance is _____
a) Zero b) Minimum c) Maximum d) Constant

P.T.O.



- vii) Unit of figure of merit (K) of a Ballistic galvanometer is _____
 a) $\mu A/mm$ b) $mm/\mu A$ c) $mm/\mu C$ d) $mm/\mu V$
- viii) In Ballistic galvanometer the function of iron core is to _____
 a) Decrease the magnetic induction
 b) Decrease the current through the galvanometer
 c) Increase the magnetic induction
 d) Keep magnetic induction constant
- ix) Magnetic induction along the axis of infinitely long solenoid is $B =$ _____
 a) $\mu_0 n^2 i$ b) $\frac{\mu_0}{ni}$ c) $\frac{\mu_0}{4\pi}$ d) $\mu_0 ni$
- x) An ideal forward biased semiconductor diode offers _____ resistance.
 a) Infinite b) Zero c) Moderate d) Minimum
- xi) Ripple factor of bridge rectifier is _____
 a) 0.482 b) 0.812 c) 1.21 d) 0.96
- xii) The junction barrier potential difference for a germanium diode is of the order of _____
 a) 0.7 V b) 1 V c) 0.3 V d) 1.7 V
- xiii) The _____ of the transistor is heavily doped.
 a) Emitter b) Base c) Collector d) Base and collector
- xiv) When both junctions of a transistor are forward biased, the transistor operates in _____
 a) Cut off region b) Forbidden region
 c) Saturation region d) Active region

2. Answer **any seven** of the following :

14

- i) What is varying current ?
- ii) Why a spark is produced at the key at the break in an L-R circuit ?
- iii) Calculate modulus of complex number $Z = 6 + 8j$.
- iv) What is rejector circuit ?
- v) Explain electromagnetic damping in Ballistic galvanometer.
- vi) State Biot-Savart's law.
- vii) Draw circuit diagram of bridge rectifier.
- viii) Derive relation between α and β .



3. A) Answer **any two** of the following : **10**
- i) Write a note on Owen's bridge.
 - ii) Obtain expression for magnetic induction at a point on the axis of current carrying coil of single turn.
 - iii) Explain working of common emitter transistor amplifier.
- B) A battery of e.m.f. 12 V is applied to a coil having resistance of 4Ω and inductance of 0.2 Henry. Calculate current flowing through coil in $\frac{1}{10}$ of the second.
(Given : $e^{-1} = 0.368$). **4**
4. Answer **any two** of the following : **14**
- i) Derive an expression for the growth of charge in a circuit containing a resistance (R), a condenser (C) and a source of constant e.m.f. in series.
 - ii) Discuss series resonant circuit. Show that at resonance, circuit is purely resistive and current in the circuit is maximum. A series resonant circuit has quality factor 6.2 and resonant frequency 7.9 Hz. Calculate its band width.
 - iii) Derive expression for measurement of charge using ballistic galvanometer.
5. Answer **any one** of the following : **14**
- i) Draw circuit diagram for zener diode as voltage regulator and explain its regulation action. The voltage regulator circuit built using a zener diode receives d.c. input voltage equal to 24 V. Calculate safety resistance if $V_z = 12\text{ V}$, $I_z = 10\text{ mA}$ and $I_L = 20\text{ mA}$.
 - ii) Explain construction and working of BJT. Discuss input, output and transfer characteristics of transistor in CB configuration.
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**B.Sc. – I (Semester – II) Examination, 2017
(CBCS Pattern) (New)
STATISTICS (Paper – III)
Descriptive Statistics – II**

Time : 2½ Hours

Max. Marks : 70

N.B. : 1) *All questions are compulsory.*
2) *Figures to the right indicate full marks.*

1. Choose the correct alternative :

14

- i) The formula for covariance between the variables $(X - a)$ and $(Y - b)$ based on n paired values, when a and b are constants is
 - a) $ab \text{ COV}(X, Y)$
 - b) $-ab \text{ COV}(X, Y)$
 - c) $\text{COV}(X, Y)$
 - d) none of these
- ii) The points of a scatter diagram are on a vertical line, the coefficient of correlation is
 - a) 0
 - b) -1
 - c) $+1$
 - d) none of these
- iii) If the variables X and Y are changes in the same directions, then correlation coefficient is
 - a) zero
 - b) one
 - c) positive
 - d) negative
- iv) The limits of Spearman's rank correlation (R) is
 - a) 0 to 1
 - b) 0 to ∞
 - c) -1 to 1
 - d) none of these
- v) The correlation coefficient is
 - a) Product of regression coefficient
 - b) Mean of regression coefficients
 - c) G.M. of regression coefficient
 - d) None of these
- vi) If one coefficient of regression is greater than one, the other must be
 - a) Less than one
 - b) Equal to one
 - c) Both a and b
 - d) None of these



vii) The two regression lines are perpendicular to each other angle between two regression lines is

- a) $\frac{\pi}{4}$ b) $\frac{\pi}{2}$ c) $\frac{\pi}{6}$ d) π

viii) Attribute is

- a) a qualitative characteristics b) a measurable characteristics
c) a quantitative characteristics d) none of these

ix) With three attributes, the total number of class frequencies of all orders equal to

- a) Eight b) Nine
c) Twenty seven d) None of these

x) Ultimate class frequencies means the frequencies of the classes of

- a) Zero order b) Lowest order
c) Highest order d) None of these

xi) Which of the following is not an example of quantitative characteristics ?

- a) Height b) Weight c) Wages d) Blood group

xii) The index number for base year is always taken as

- a) 100 b) 1000 c) 10000 d) None of these

xiii) The best average in the construction of index number is

- a) A.M. b) G.M. c) H.M. d) None of these

xiv) The weights used in Paasche's formula belongs to

- a) The base period b) Arbitrary chosen period
c) The given period d) None of these

2. Answer **any seven** of the following :

14

- i) Define positive correlation and negative correlation.
- ii) Prove that $\text{Corr}(X, X) = 1$.
- iii) Define Covariance between X and Y.
- iv) Define two regression coefficients.



- v) Explain the line of regression of X on Y.
 - vi) Define Ultimate class frequency.
 - vii) Define positive class frequency and negative class frequency.
 - viii) Define Laspeyre’s quantity index number.
 - ix) Define Fisher’s price index number.
3. A) Write short note on **any two** of the following : 10
- i) Write short note on index number.
 - ii) What is the effect of change of origin and scale on correlation coefficient ?
 - iii) Find the conditions of consistency of data related to two attributes A and B.
- B) With usual notation, prove that 4
- a) $r = \sqrt{b_{yx} b_{xy}}$ b) $b_{yx} + b_{xy} \geq 2r$.
4. Answer **any two** of the following : 14
- i) With usual notation, prove that
- $$R = 1 - \frac{6 \sum d_i^2}{n^3 - n}$$
- ii) What is time reversal test of consistency ? Verify the same for Laspeyre’s index number.
 - iii) Obtain the expression for the acute angle θ between the two regression lines. Interpret the results $\theta = 0, \theta = \frac{\pi}{2}$.
5. Answer **any two** of the following : 14
- i) Derive the equations of lines of regression of Y on X by the method of least square.
 - ii) Define Yule’s coefficient of association (Q) and coefficient of colligation (Y) and show that
- $$Q = \frac{2y}{1 + y^2}$$
- iii) What are index numbers ? How are they constructed ? What are their uses ?
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B.Sc. – I (Semester – II) Examination, 2017
(CBCS Pattern) (New)
STATISTICS (Paper – IV)
Probability and Probability Distributions – II

Time : 2½ Hours

Max. Marks : 70

N.B. : 1) **All questions are compulsory.**
2) **Figures to the right indicate full marks.**

1. Choose the correct alternative :

14

i) For a discrete r. v. X , the second moment about mean is called, second _____ moment.

- a) Raw b) Factorial c) Central d) None of these

ii) Variance is independent of

- a) Change of origin b) Change of scale
c) Change of origin and scale d) None of these

iii) If X is a r. v. with mean μ then $E(X-\mu) =$

- a) μ b) 2μ c) 0 d) $X-\mu$

iv) If X is a r. v. then

- a) $E(X^2) = [E(X)]^2$ b) $E(X^2) \geq [E(X)]^2$
c) $E(X^2) \leq [E(X)]^2$ d) None of these

v) For the following probability distribution

X : 0 1 2 3

$P(x)$: $\frac{1}{4}$ $\frac{1}{4}$ $\frac{1}{4}$ $\frac{1}{4}$

Then $V(2X) =$

- a) 20 b) $\frac{15}{12}$ c) 0 d) 2.5

vi) If X is a discrete r. v. with p.m.f. $p(x)$ then $E\left(\frac{1}{X}\right)$ is given by

- a) $\sum \frac{x}{p(x)}$ b) $\sum \frac{p(x)}{x}$ c) $\frac{1}{\sum xp(x)}$ d) $\sum x p(x)$

P.T.O.



- vii) If X and Y are independent r.v.s. then
- a) $E(X + Y) = E(X) + E(Y)$ b) $E(X.Y) = E(X).E(Y)$
 c) $P(x, y) = P(x).P(y)$ d) All of these
- viii) If X and Y are two independent r.v.s. then $v(x - y) =$
- a) $v(x) + v(y) - 2 \text{cov}(x, y)$ b) $v(x) + v(y) + 2 \text{cov}(x, y)$
 c) $v(x) + v(y)$ d) $v(x) - v(y)$
- ix) The p.m.f. of one point distribution is
- a) $P(X = 1) = K$ b) $P(X = K) = 1$
 c) $P(X = K) = \frac{1}{2}$ d) $P\left(X = \frac{1}{2}\right) = 0$
- x) If X_1, X_2, \dots, X_n are independent and identically distributed Bernoulli r.v.s. then the distribution of $Y = \sum_{i=1}^n X_i$ is
- a) Bernoulli b) Discrete uniform
 c) Hypergeometric d) Binomial
- xi) If $P(x) = \frac{1}{5}$ $x = 10, 20, 30, 40, 50$
 $= 0$ otherwise
- then the distribution of r.v. X is identical to _____ Distribution.
- a) Discrete uniform b) Binomial
 c) Hypergeometric d) Two point
- xii) Suppose a box contain 4 white and 6 black balls. Three balls are drawn randomly without replacement. A r.v. X is defined as number of white balls obtained. Then probability distribution of r.v. X is identical to _____ distribution.
- a) Bernoulli b) Binomial
 c) Hypergeometric d) None of these
- xiii) The probability generating function of Bernoulli distribution is
- a) $(s + pq)$ b) $(p + qs)$
 c) $(p + s + q)$ d) $(q + ps)$
- xiv) Variance of one point distribution is
- a) 1 b) 2
 c) 0 d) None of these



2. Answer **any seven** of the following : 14

- i) Define expectation of function of r.v.X.
- ii) Define second factorial moment.
- iii) Suppose a r.v.X takes values 1, 2, 3 with $P(X = 2) = 0.2$ and $E(X) = 2$, then find $P(X = 1)$.
- iv) In usual notation if $\mu'_1 = 3$, $\mu'_2 = 15$ find $V(X + 10)$.
- v) If $V(X) = 2$, $V(Y) = K$. If X and Y are independent r.v.s. such that $V(3x - Y) = 27$, find K.
- vi) If X and Y are two discrete r.v.s. and a and b are any constants, then in usual notations state the expression for
 - a) $E(aX + bY)$
 - b) $V(aX + bY)$
- vii) State the p.m.f. of hypergeometric distribution with parameters N, M and n in usual notation.
- viii) Define Bernoulli random variable.
- ix) Define binomial distribution.

3. A) Write short note on **any two** of the following : 10

- i) State and prove the recurrence relation for probabilities of binomial distribution.
- ii) With usual notation prove that $V(aX + b) = a^2 V(X)$.
- iii) The joint p.m.f. of r.v. (X, Y) is

$$P(x, y) = \begin{cases} \frac{1}{4} & x = 1, 2 ; y = 1, 2 \\ 0 & \text{otherwise} \end{cases}$$

Discuss the independence of X and Y.

B) A r.v. X has following probability distribution : 4

X	:	0	1	2	3
P(x)	:	$\frac{1}{6}$	$\frac{1}{2}$	$\frac{3}{10}$	$\frac{1}{30}$

Find $E(X)$ and $V(X)$.



4. Answer **any two** of the following :

14

i) The joint probability distribution of r.v. (X, Y) is

X \ Y	1	2	3
1	0	$\frac{1}{3}$	0
2	$\frac{1}{3}$	0	$\frac{1}{3}$

Find (a) Marginal probability distribution of X and Y (b) $E(X + Y)$.

ii) Define two point distribution and find its mean and variance.

iii) Derive and identify the distribution of sum of independent and identically distributed 'n' Bernoulli random variables.

5. Answer **any two** of the following :

14

i) The joint probability distribution of r.v. (X, Y) is

X \ Y	0	1	2
0	$\frac{1}{9}$	$\frac{2}{9}$	0
1	0	$\frac{2}{9}$	$\frac{1}{9}$
2	$\frac{1}{9}$	0	$\frac{2}{9}$

Find $E(X/Y=2)$

ii) Find mean and variance of binomial distribution.

iii) Define :

a) A two dimensional discrete r.v.

b) Marginal probability distribution of X and

c) Conditional probability distribution of Y given $X = x$.



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B.Sc. I (Semester – II) (New – CBCS) Examination, 2017
MATHEMATICS (Paper – III)
Geometry

Time : 2½ Hours

Max. Marks : 70

- N.B. :** 1) **All questions are compulsory.**
2) **Figures to the right indicate full marks.**
3) **All questions carry equal marks.**

1. Choose the correct alternative for **each** of the following : **14**
- 1) The polar equation of $xy = 2$ is
a) $r = \cos \theta$ b) $r = \sin \theta$ c) $r = \sin 2\theta$ d) $r^2 \sin^2 2\theta = 4$
- 2) $r = 4 \sin \theta$ is the polar equation of the curve then its Cartesian equation is
a) $x^2 + y^2 - 4y = 0$ b) $x^2 + y^2 - 4x = 0$
c) $x^2 + y^2 = 4$ d) $x^2 + y^2 - xy = 0$
- 3) The equation $x^2 + 2xy + y^2 - 2x - 1 = 0$ represents
a) circle b) parabola c) hyperbola d) an ellipse
- 4) The general second degree equation represent an ellipse if and only if
a) $\Delta = 0, h^2 - ab = 0$ b) $\Delta = 0, a + b = 0$
c) $\Delta \neq 0, h^2 - ab < 0$ d) $\Delta = 0, h^2 - ab < 0$
- 5) If by rotation of axes through an angle θ , the expression
 $3x^2 + 2xy + 3y^2 - 18x - 22y + 55 = 0$ does not contain the cross product term xy
then $\theta =$
a) $\frac{\pi}{3}$ b) $\frac{\pi}{4}$ c) $\frac{\pi}{6}$ d) $\frac{\pi}{2}$
- 6) The tangent plane to the sphere $x^2 + y^2 + z^2 = 14$ at the point (1, 2, 3) is
a) $x + 2y + 3z = 14$ b) $x - 2y + 3z = 14$
c) $2x + y + 3z = 14$ d) $x + y + z = 14$
- 7) The radius of sphere $x^2 + y^2 + z^2 - 4x - 6y + 8z + 4 = 0$ is
a) 5 b) -5 c) 4 d) 6



- 8) The centre of sphere $x^2 + y^2 + z^2 + 6x + 4y + 4z + 16 = 0$
 a) (3, 2, 2) b) (-3, -2, -2) c) (3, -2, -2) d) (1, 2, 3)
- 9) The equation of sphere described on (2, -3, 1) and (3, -1, 2) as extremities of a diameter is
 a) $x^2 + y^2 + z^2 + 5x - 4y - 3z + 11 = 0$
 b) $x^2 + y^2 + z^2 + 5x - 4y + 3z - 11 = 0$
 c) $x^2 + y^2 + z^2 - 5x + 4y - 3z + 11 = 0$
 d) None of these
- 10) Intersection of two sphere is
 a) circle b) straight line c) plane d) sphere
- 11) Two planes $a_1x + b_1y + c_1z + d_1 = 0$ and $a_2x + b_2y + c_2z + d_2 = 0$ are parallel if
 a) $a_1a_2 + b_1b_2 + c_1c_2 = 0$ b) $\frac{a_1}{a_2} + \frac{b_1}{b_2} + \frac{c_1}{c_2} = 0$
 c) $\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$ d) None of these
- 12) The angle between the planes $2x - y + z = 6$ and $x + y + 2z = 7$ is
 a) $\frac{\pi}{4}$ b) $\frac{\pi}{3}$ c) $\frac{\pi}{2}$ d) None of these
- 13) The distance of the plane $2x - 3y + 6z + 14 = 0$ from the origin is
 a) 2 b) 11 c) -2 d) 13
- 14) The number of arbitrary constant in the equation $Ax + By + Cz = D$ is
 a) 1 b) 2 c) 3 d) None of these

2. Attempt **any seven** from the following :

14

- 1) Transform the equation $2x^2 + y^2 - 4x + 4y = 0$ when the origin is shifted to (1, -2).
- 2) Find the polar coordinates of the points whose Cartesian coordinates given as $A(-\sqrt{3}, 1)$.
- 3) Identify the conic given by the equation $x^2 + xy + y^2 + x + y - 1 = 0$.
- 4) Find the angle between $11x + 6y + 5z + 86 = 0$ and $3x - 6y + 2z + 5 = 0$.
- 5) Show that origin and the point $A(2, -4, 3)$ lie on different sides of the plane $x + 3y - 5z + 7 = 0$.



- 6) Show that the three points $(-2, 3, 5)$, $(1, 2, 3)$, $(7, 0, -1)$ are collinear.
- 7) Find centre and radius of sphere $x^2 + y^2 + z^2 - 2x + 4y - 6z = 2$.
- 8) Obtain the equation of the sphere described on the join of $A(2, -3, 4)$, $B(-5, 6, -7)$ as diameter.
- 9) Find the equation of sphere whose centre is at $C(2, 3, -4)$ and radius 5.

3. A) Attempt **any two** of the following : **10**

- 1) If, by rotation of axes, the expression $\alpha x + \beta y$ changes to $\alpha'x' + \beta'y'$ then prove that $\alpha^2 + \beta^2$ is invariant.
- 2) Find the equation of plane passing through $(2, 1, 1)$ and line of intersection of planes $2x + 3y + 4z = 5$ and $3x - 2y + z + 1 = 0$.
- 3) Show that the equation of tangent plane to the sphere $x^2 + y^2 + z^2 + 2ux + 2vy + 2wz + d = 0$ at a point $p(x, y, z)$ is $xx_1 + yy_1 + zz_1 + u(x + x_1) + v(y + y_1) + w(z + z_1) + d = 0$.

B) Transforms the equation $x^2 + 4xy + y^2 = a^2$ when axes are rotated through an angle $\frac{\pi}{4}$. **4**

4. Attempt **any two** of the following : **14**

- 1) Find the normal form of the equation of a plane.
- 2) Show that second degree equation $x^2 + y^2 + z^2 + 2ux + 2vy + 2wz + d = 0$ represents a sphere with centre $(-u, -v, -w)$ and radius $= \sqrt{u^2 + v^2 + w^2 - d}$.
- 3) If axes are rotated through an angle θ , the equation $ax^2 + 2hxy + by^2$ transform into $a'x'^2 + b'y'^2$ then prove that $\theta = \frac{1}{2} \tan^{-1} \left(\frac{2h}{a - b} \right)$.

5. Attempt **any two** of the following : **14**

- 1) Show that the plane $2x - 2y + z + 16 = 0$ touches the sphere $x^2 + y^2 + z^2 + 2x - 4y + 2z = 3$. Find the point of contact.
 - 2) If by rotation of axes, the expression $ax^2 + 2hxy + by^2$ becomes $a'x'^2 + 2h'x'y' + b'y'^2$ then show that $a + b$ and $ab - h^2$ are invariant.
 - 3) Find the equation of a plane passing through three points $P(3, 4, 2)$, $Q(4, 6, 5)$, $R(8, 2, 9)$.
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B.Sc. – I (Semester – II) (CBCS) (New) Examination, 2017
MATHEMATICS (Paper – IV)
Differential Equations

Time : 2½ Hours

Max. Marks : 70

N. B. : 1) **All questions are compulsory.**
2) **Figures to the right indicate full marks.**

1. Choose the correct alternative for each of the following and rewrite the sentence : **14**i) The differential equation $Mdx + Ndy = 0$ possess a/an _____ number of integrating factors.

- a) One b) Finite c) Infinite d) None

ii) The Homogeneous differential equation can be reduced to variable separable form by putting _____

- a)
- $y = vx^2$
- b)
- $y = \frac{v}{x^2}$
- c)
- $y = \frac{v}{x}$
- d)
- $y = vx$

iii) The solution of $\frac{dy}{dx} = e^{x-y} + x^2e^{-y}$ is _____

- a)
- $e^y = \frac{x^3}{3} + e^x + c$
- b)
- $e^{-y} = \frac{x^3}{3} + e^x + c$
-
- c)
- $e^y = x^3 + e^{-x} + c$
- d)
- $e^y = -x^3 + e^{-x} + c$

iv) The equation of the form $\frac{dy}{dx} + Py = Qy^n$ where P and Q are functions of x alone or constant is called _____

- a) An exact differential equation b) Linear differential equation
-
- c) Bernoulli's differential equation d) None of these

v) The integrating factor of $(x^2 + y^2 + x)dx + (xy)dy = 0$ is _____

- a) y b) x c)
- $\frac{1}{x}$
- d)
- $\frac{1}{y}$



xii) The value of $\frac{1}{D^3 - 3D + 2}x =$ _____

a) $x + \frac{9}{20}$

b) $\frac{1}{2}\left(x + \frac{9}{10}\right)$

c) $\frac{1}{2}\left(x + \frac{3}{2}\right)$

d) $\frac{1}{2}(x + 3)$

xiii) The complementary function of the equation $(D^2 - 2D + 1)y = x^2 - 1$ is _____

a) $x^2 + 4x + 1$

b) $c_1e^x + c_2e^x$

c) $(c_1 + c_2)e^x + x^2 + 4x + 1$

d) $(c_1 + c_2x)e^x$

xiv) The particular integral of $(D^2 - 4D + 4)y = e^{2x}x^2$ is _____

a) $e^{2x} \frac{x^4}{12}$

b) $e^{2x} \frac{x^2}{6}$

c) $e^{2x} \frac{-x^3}{4}$

d) $e^x \frac{x^3}{8}$

2. Attempt **any seven** of the following :

14

i) Solve : $\sec^2x \tan y dx + \sec^2y \tan x dy = 0$.

ii) Define the term Homogeneous equations of the first order and of any degree in x and y.

iii) What is meant by exact differential equation ?

iv) Explain how to solve the equation $Mdx + Ndy = 0$ where $M = f(x)$ and $N = \phi(y)$.

v) Find the integrating factor of $(x^2 + y^2 + 1)dx - 2xydy = 0$.

vi) Solve : $\frac{d^3y}{dx^3} - 5\frac{d^2y}{dx^2} + 8\frac{dy}{dx} - 4y = 0$.

vii) Evaluate $\frac{1}{D+2}\cos x$.

viii) Evaluate $\frac{1}{(D^2 + a^2)^2}\cos ax$.

ix) Find the particular integral of $(D^2 + 4D + 4)y = e^{-2x}$.



3. A) Attempt **any two** of the following :

10

i) Solve $(x^2 + y^2)dx - 2xydy = 0$.

ii) Solve $\frac{dy}{dx} = x^3y^3 - xy$.

iii) Find the meaning of $\frac{1}{D-a}X$.

B) Show how to solve $\frac{dy}{dx} + Py = Q$ where P, Q are functions of x.

4

4. Attempt **any two** of the following :

14

i) What is meant by Non-Homogeneous differential equation ? Explain how to solve it in detail.

ii) In the usual notation, prove that $\frac{1}{f(D)}e^{ax} = \frac{1}{f(a)}e^{ax}$, if $f(a) \neq 0$ and modify the result if $f(a) = 0$.

iii) Solve :

a) $(y^2e^{xy^2} + 4x^3)dx + (2xye^{xy^2} - 3y^2)dy = 0$.

b) Solve : $\frac{d^2y}{dx^2} + 2\frac{dy}{dx} + y = x \cos x$.

5. Attempt **any two** of the following :

14

i) With usual meanings, show that $\frac{1}{f(D)}xV = \left\{x - \frac{1}{f(D)}f'(D)\right\} \frac{1}{f(D)}V$ where V is a function of x.

ii) a) Solve $\frac{dy}{dx} + \frac{4x}{x^2+1}y = \frac{1}{(x^2+1)^3}$.

b) Solve $e^{x+y}\left(x\frac{dy}{dx} + y\right) - e^{xy}\left(1 + \frac{dy}{dx}\right) = 0$.

iii) With usual notation show that $\frac{1}{\phi(D^2)}\sin ax = \frac{1}{\phi(-a^2)}\sin ax$ and hence solve $\frac{d^2y}{dx^2} - 5\frac{dy}{dx} + 6y = \sin 3x$.



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**B.Sc. – I (Semester – II) (New) (CBCS Pattern) Examination, 2017
ELECTRONICS (Paper – III)
Semiconductor Devices**

Time : 2½ Hours

Max. Marks : 70

- Instructions :** 1) **All questions are compulsory and carry equal marks.**
2) **Figures to the right indicate full marks.**
3) **Draw neat labelled diagrams wherever necessary.**
4) **Use of calculator and log table is allowed.**

1. Choose correct alternative for the following and rewrite the sentence : **14**
- i) As temperature increases the leakage current of the diode
 - a) increases
 - b) decreases
 - c) remains the same
 - d) does not flow
 - ii) A doped semiconductor is called as
 - a) intrinsic semiconductor
 - b) extrinsic semiconductor
 - c) pure semiconductor
 - d) none of these
 - iii) Color of the light emitted by the LED depends on
 - a) current
 - b) voltage
 - c) temperature
 - d) semiconductor used
 - iv) A zener diode is formed by _____ impurity.
 - a) lightly doped
 - b) heavily doped
 - c) both a) and b)
 - d) none of these
 - v) For detecting light intensity, we use
 - a) LED
 - b) Zener diode
 - c) Photodiode
 - d) Tunnel diode
 - vi) The principle used in varactor diode, is variation of
 - a) resistor
 - b) inductor
 - c) capacitor
 - d) carriers
 - vii) The base of a transistor is _____ doped.
 - a) heavily
 - b) lightly
 - c) moderately
 - d) none of these



- viii) The BJT generally operate in _____ region, so it gives amplification.
a) active b) cutoff c) saturation d) none of these
- ix) For the proper operation of the JFET gate terminal is _____ biased.
a) forward b) reverse
c) forward as well as reverse d) none of these
- x) In an n-channel JFET, the charge carriers are
a) electrons b) holes
c) both electrons and holes d) none of these
- xi) MOSFET is a
a) voltage controlled device b) field controlled device
c) current controlled device d) power controlled device
- xii) The control element in SCR is
a) gate b) cathode c) anode d) base
- xiii) _____ is a bidirectional device with three terminals.
a) Triac b) Diac c) SCR d) IGBT
- xiv) Which of the following acts like a diode and two resistors ?
a) SCR b) Triac c) Diac d) UJT

2. Attempt **any seven** of the following :

14

- i) What is an intrinsic semiconductor ?
- ii) A typical diode has the forward current and voltages as : 8 mA at 0.6 V, 18 mA at 0.7 V and 50 mA at 0.8 V. Calculate the static and dynamic resistance of the diode.
- iii) Compare semiconductor diode and zener diode.
- iv) What is a transistor ? Draw the symbol of NPN and PNP transistor.
- v) Write diode equation and define volt equivalent of temperature (V_T).
- vi) State the applications of MOSFET.
- vii) Write applications of photodiode.
- viii) Compare Diac and Triac.
- ix) Draw symbol of enhancement type MOSFET and depletion type MOSFET.



3. A) Attempt **any two** of the following : **10**
- i) What is a LED ? Explain construction and working of LED.
 - ii) Explain input and output characteristics of a transistor in CE configuration.
 - iii) Define the terms : drain resistance, transconductance and amplification factor of JFET. Deduce the relation between them.
- B) Due to $V_{cc} = 12$ volt, the collector current flowing through transistor is 2 mA and base current is $100 \mu A$. Calculate β and α . **4**
4. Attempt **any two** of the following : **14**
- i) What is a tunnel diode ? Explain the V-I characteristics of a tunnel diode.
 - ii) Describe the formation of PN junction. Explain I-V characteristics of a PN junction diode.
 - iii) Explain construction and working of a UJT.
5. Attempt **any two** of the following : **14**
- i) Explain the breakdown mechanism in zener diode. List the applications of zener diode.
 - ii) Explain with neat circuit diagram of I-V characteristics of N-channel JFET.
 - iii) Explain construction and working of SCR. Give applications of SCR.
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B.Sc. – I (Semester – II) (New-CBCS) Examination, 2017
ELECTRONICS
Digital Electronics (Paper – IV)

Time : 2.30 Hours

Total Marks : 70

- Instructions :** 1) **All** questions are **compulsory** and carry **equal** marks.
2) Figures to the **right** indicate **full** marks.
3) **Use** of calculator is **permissible**.
4) Draw **neat** labeled diagram **wherever** necessary.

1. Select the **correct** alternatives from the following : **14**
- 1) In RS flip-flop if $R = 1$, $S = 0$, then this state is called as _____ state.
- a) Set b) Reset
c) Forbidden d) Toggle
- 2) T flip-flop is constructed by using _____ flip-flop.
- a) RS b) D
c) M/S JK d) None of these
- 3) For decade counter minimum number of flip-flops requires are _____
- a) 10 b) 5
c) 4 d) 2
- 4) _____ counter has maximum delay time.
- a) Series b) Parallel
c) Series and Parallel d) None of these
- 5) SISO shift register means _____
- a) Serial In Standard Out b) Serial In Serial Out
c) Standard In Serial Out d) Standard In Standard Out



2. Attempt **any seven** of the following : **14**
- 1) Give the truth table of TTL NAND gate.
 - 2) What is current sourcing ?
 - 3) Draw the diagram of 2:4 decoder.
 - 4) Mention various types of flip-flops.
 - 5) Give the truth table of M/S JK flip-flops.
 - 6) What is ring counter ?
 - 7) What is Demultiplexer ?
 - 8) Draw the timing diagram of divide by two counter.
 - 9) Draw the circuit diagram of RS flip-flop using NOR gate.
3. A) Attempt **any two** of the following : **10**
- 1) Explain 4 to 1 multiplexer with suitable diagram.
 - 2) Explain D flip-flop in detail.
 - 3) Draw the circuit diagram of TTL NAND gate.
- B) Explain any two specifications of TTL logic family. **4**
4. Attempt **any two** of the following : **14**
- 1) Explain 3 : 8 decoder.
 - 2) Explain 1 to 4 Demultiplexer.
 - 3) Explain 3-bit synchronous binary counter.
5. Attempt **any two** of the following : **14**
- 1) Explain decimal to BCD encoder.
 - 2) Explain the SISO shift register.
 - 3) Draw the timing diagram of decade counter.
- Calculate the frequency at the output of decade counter, when 1 KHz frequency square wave is connected at the input.
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B.Sc. – I (Semester – II) Examination, 2017
COMPUTER SCIENCE
Introduction to Web Designing (New CBCS) (Paper No. – III)

Time : 2½ Hours

Max. Marks : 70

Instructions: 1) **All questions are compulsory.**
2) Figure to the **right** place indicate **full** marks.

1. A) Choose correct alternatives : **10**
- 1) HTML stands for
 - A) Hyper Text Markup Language
 - B) High Text Markup Language
 - C) Hyper Tabular Markup Language
 - D) None of these
 - 2) Which of the following tag is used to mark a beginning of paragraph ?
 - A) <TD>
 - B)

 - C) <P>
 - D) <TR>
 - 3) From which tag descriptive list starts ?
 - A) <LL>
 - B) <DD>
 - C) <DL>
 - D) <DS>
 - 4) We may add more than one form tag in web
 - A) True
 - B) False
 - 5) In a table, the CSS _____ property can be used to specify the amount of space between the borders of each cell.
 - A) border-padding
 - B) padding
 - C) spacing
 - D) border-spacing
 - 6) What are variables used for in JavaScript Programs ?
 - A) Storing numbers, dates or other values
 - B) Varying randomly
 - C) Causing high-school algebra flashbacks
 - D) None of the above



7) When a visitor clicks the submit button on a form, the _____ of each form element is sent.

- A) label
B) name
C) value
D) name-value pair

8) Which HTML element do we put the JavaScript ?

- A) <js>
B) <scripting>
C) <script>
D) <javascript>

9) HTML is what type of language ?

- A) Scripting Language
B) Markup Language
C) Programming Language
D) Network Protocol

10) The common element which describe the web page, is ?

- A) Heading
B) Paragraph
C) List
D) All of these

B) State the following statements **true/false** :

4

- 1) Tags and text that are not directly displayed on the page are written in head section.
- 2) HTML tags are surrounded by curly type of brackets.
- 3) You can write CSS once and then reuse same sheet in multiple HTML pages.
- 4) JavaScript is a lightweight, interpreted programming language.

2. Answer **any seven** of the following :

14

- 1) What is the use of CSS ?
- 2) Define Internet.
- 3) Explain Anchor tag.
- 4) What is DOCTYPE element ?
- 5) What is long form of CSS and DOM ?



- 6) List out data types of JavaScript.
 - 7) List out different operators in JavaScript.
 - 8) Explain need of HTML5.
 - 9) Define Networking.
3. A) Answer **any two** of the following : **10**
- 1) Explain structure of HTML.
 - 2) Explain CSS types in detail.
 - 3) Explain LAN, MAN, WAN in detail.
- B) Explain array of JavaScript. **4**
4. Answer **any two** of the following : **14**
- 1) Explain different types of topology with suitable diagram.
 - 2) Explain table tag with example.
 - 3) Write a JavaScript program to check given no. is odd or even.
5. Answer **any two** of the following : **14**
- 1) Write a JavaScript program to check given number is prime or not.
 - 2) Explain text formatting tags in detail.
 - 3) Explain CSS properties in detail.
-



3. A) Attempt **any two** of the followings : **10**
- 1) Explain array of structure with suitable example.
 - 2) What is file ? Explain fopen() and fgetc() functions.
 - 3) Write a program to check entered number is prime or not with using function with argument without return value.
- B) What is difference between array and structure ? **4**
4. Attempt **any two** of the followings : **14**
- A) What are different storage classes in 'C' ? Explain register storage class in detail with example.
 - B) What is the pass by address or pass by pointer ? Give one example.
 - C) What is dynamic memory allocation ? Explain with example.
5. Attempt **any two** of the followings : **14**
- A) Explain "pointer to function" concept with example.
 - B) Write a program to traversing array elements by using pointer.
 - C) Explain different file opening modes with example.
-



- 11) The lines joining the places of equal atmospheric temperature are called as
 a) Isohyets b) Isotherms c) Isobars d) Isoclines
- 12) In the albedo of earth about _____% of incoming short wave radiation is reflected from top layer of atmosphere and not reaches upto earth surface.
 a) 25 b) 35 c) 51 d) 19
- 13) The gravitational force is maximum at _____ region on the earth surface.
 a) Polar b) Equatorial c) Mid-latitude d) None of them
- 14) The standard pressure at sea level is _____ millibars.
 a) 1013.2 b) 1033.2 c) 1012.3 d) 1034.12

2. Write answers in short (**any seven**) :

14

- 1) Gases in the atmosphere.
- 2) Daily range of temperature.
- 3) Horse latitude.
- 4) Solar constant.
- 5) Characteristics of polar winds.
- 6) Difference climate and weather.
- 7) Ozonosphere.
- 8) Diagrams of cyclones.
- 9) State the normal lapse rate.

3. A) Write a short notes (**any two**) :

10

- 1) Define weather and state its various elements.
- 2) Define climatology and state its importance.
- 3) Describe the composition of atmosphere.

B) Draw the diagram of climatic zone on the earth and state it.

4

4. Write **any two** answers in brief :

14

- 1) State the various factors affecting on the distribution of insolation on the earth surface.
- 2) State the vertical distribution of temperature on the earth surface.
- 3) Explain NW Indian monsoon with suitable diagram.

5. Answer **any two** questions :

14

- 1) Describe the planetary winds with schematic diagram.
- 2) State the structure of atmosphere with diagram.
- 3) State the global heat budget with suitable diagram.



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**B.Sc. – I (Semester – II) (CBCS Pattern) Examination, 2017
PHYSICAL GEOGRAPHY (Paper – IV) (New)
Oceanography**

Time : 2½ Hours

Max. Marks : 70

- Instructions:** 1) *All questions are compulsory.*
2) *Draw neat diagrams and maps wherever necessary.*
3) *Use of map stencils is allowed.*
4) *Figures to the right indicate full marks.*

1. Choose the correct alternative :

14

- 1) _____ is a very deep trench in Pacific Ocean.
A) Mariyana B) Sunda C) Tonga D) Qurail
- 2) _____ is the branch of physical geography.
A) Economic geography B) Political geography
C) Oceanography D) Population geography
- 3) Isohalines are the lines showing the distribution of
A) Temperature B) Depth C) Salinity D) Height
- 4) The Gulf Stream ocean current flows in
A) Indian Ocean B) Atlantic Ocean
C) Pacific Ocean D) Arctic Ocean
- 5) The shallow stretch of ocean floor adjoining land is known as
A) Continental Slope B) Continental Shelf
C) Abyssal Plain D) Ocean Deep
- 6) Sunda trench is located in _____ ocean.
A) Indian Ocean B) Atlantic Ocean
C) Pacific Ocean D) Arctic Ocean
- 7) Canary current flows along
A) West Africa B) East Africa
C) North West America D) North Europe

P.T.O.



- 8) Salinity is expressed in terms of amount _____ per thousand.
A) Kilometer B) Gram C) Second D) Quintal
- 9) The top part of sea wave is called as
A) Trough B) Cyclone C) Crest D) Neap tide
- 10) Great Barrier Reef is found along the _____ coast of Australia.
A) East B) West C) South D) North
- 11) Glacial control theory of coral formation introduced by
A) Davis B) Murray C) Daly D) Darwin
- 12) Labrador ocean current is _____ type of current.
A) Cold B) Warm C) Very cold D) Very warm
- 13) Average salinity of ocean and sea is
A) 35% B) 39% C) 30% D) 45%
- 14) The salinity of Dead Sea is _____ %.
A) 330 B) 238 C) 240 D) 220

2. Write in brief (**any seven**) :

14

- 1) State the currents of the Atlantic Ocean.
- 2) What is the ocean currents ?
- 3) What is Sargasso ?
- 4) State the types of coral reefs.
- 5) State the types of tides.
- 6) State the types of the ocean currents.
- 7) State the types of sea waves.
- 8) Types of the terrigenous deposits.
- 9) What is Oceanography ?

3. A) Write in brief answers (**any two**) :

10

- 1) Describe the ocean currents in the Pacific Ocean.
- 2) Write an account of the factors affecting the temperature of sea and oceans.
- 3) Describe the importance of oceanography.

B) Draw a neat diagram the surface configuration of ocean floor.

4



4. Write in short (**any two**) : **14**
- 1) Describe the various factors affecting the salinity of sea and ocean.
 - 2) Describe classification of ocean deposits.
 - 3) Explain the theories of coral formation with suitable examples.
5. Write answers of **any two** questions : **14**
- 1) Describe various types of coral reefs in detail.
 - 2) Explain the distribution of salinity in the sea and ocean water.
 - 3) Describe the factors affecting on ocean currents.
-



- 9) Three chamber heart is present in
a) Amphioxus b) Labeo c) Frog d) Scoliodon
- 10) Male frog shows presence of
a) Vocal sacs b) neck c) tail d) all the above
- 11) In _____ jaws and paired appendages are absent.
a) frog b) cyclostomates
c) labeo d) scoliodon
- 12) All gills in Labeo are
a) Abranch b) Hemibranch
c) Demibranch d) Holobranch
- 13) Frog is _____ animal.
a) ureotelic b) aminotelic c) iodotelic d) uricotelic
- 14) Axolotl larva is example of
a) regeneration b) mimicry c) comouflage d) neotany

2. Write short notes on (**any seven**).

14

- 1) Salient features of Pisces.
- 2) Functions of fins in fishes.
- 3) Sperm of frog.
- 4) Placoid scales.
- 5) Pancreatic juice of frog.
- 6) Tongue of frog.
- 7) Neotany.
- 8) WBCs of frog.
- 9) Parental care in Amphibia.

3. A) Attempt **any two** of the following.

10

- 1) Describe the digestion in stomach of frog.
- 2) External structure of heart of frog.
- 3) Describe Ammocoetus larva.

B) Functions of liver.

4



4. Answer **any two** of the following. **14**
- 1) Describe the skin respiration in frog.
 - 2) Give general characters of cyclostomes.
 - 3) Describe the brain of frog.
5. Answer **any two** of the following. **14**
- 1) Describe excretory system of frog.
 - 2) Describe the structure of gill in bony fish and add a note on mechanism of gill respiration.
 - 3) Describe female reproductive system of frog.
-



- 6) _____ is an example of palaeontological evidence of evolution.
- a) Long neck in Giraffe
 - b) Limb bones
 - c) Archaeopteryx
 - d) Vestigial organs
- 7) The proportion of queen, drone and worker bees in an ideal bee hive is _____
- a) 1 : 10 : 10
 - b) 1 : 10 : 100
 - c) 1 : 1 : 100
 - d) 1 : 1 : 10
- 8) The domestication of milk producing animals are called _____
- a) Dairy science
 - b) Goat farming
 - c) Piggary
 - d) Vermiculture
- 9) _____ is a good example of camouflage.
- a) Stick insect
 - b) Butterfly
 - c) Chameleon
 - d) Moth
- 10) The extract of vermiculture is called _____
- a) Vermicompost
 - b) Vermiwash
 - c) Vermin
 - d) Vermicomponent
- 11) _____ is a social insect.
- a) Silk moth
 - b) Butterfly
 - c) Lac insect
 - d) Honey bee
- 12) In a food chain _____ are primary producers.
- a) Plants
 - b) Micro organisms
 - c) Animals
 - d) Higher animals
- 13) _____ is basic source of energy in biological world.
- a) Temperature
 - b) Sunlight
 - c) Soil
 - d) Water
- 14) Silk is valuable product of _____
- a) Sericulture
 - b) Apiculture
 - c) Lac culture
 - d) Pisciculture



2. Answer **any seven** of the followings : **14**
- i) Ethology.
 - ii) Groupism in animals.
 - iii) Biosphere.
 - iv) Secondary succession.
 - v) Communication in honey bees.
 - vi) Lamarckism.
 - vii) Pearl culture.
 - viii) Poultry Science.
 - ix) Fishery.
3. A) Answer **any two** of the followings : **10**
- i) Describe camouflage in chameleon.
 - ii) Describe in brief an anatomical evidences of evolution.
 - iii) Describe the ecological pyramids.
- B) Describe the grass land ecosystem. **4**
4. Answer **any two** of the followings : **14**
- i) What is vermitechnology ? Describe vermicompost and vermiwash.
 - ii) Describe interspecific groupism.
 - iii) What is ecological succession ?
5. Answer **any two** of the followings : **14**
- i) Describe the castes and their duties of honey bees in a bee hive.
 - ii) Define evolution. Describe palaeontological evidences of evolution.
 - iii) Describe courtship behavior in birds.
-



Seat No.	
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B.Sc. – I (Semester – II) (New CBCS Pattern) Examination, 2017
BOTANY (Paper – III)
Mycology and Phytopathology

Time : 2.30 Hours

Total Marks : 70

- N.B.:** 1) **All** questions are **compulsory**.
2) Draw **neat** and labelled diagrams **whenever** necessary.
3) Figures to the **right** indicate **full** marks.

1. Rewrite the following sentences by choosing **correct** answer from the given alternatives :

14

- 1) The branch of botany which deals with the study of _____ is called as mycology.
a) Bacteria
b) Fungi
c) Algae
d) Gymnosperm
- 2) _____ is used for commercial production of ethanol.
a) Mushroom
b) Yeast
c) Albugo
d) Rust
- 3) Mucor belongs to class _____
a) Zygomycetes
b) Omycetes
c) Ascomycetes
d) Basidiomycetes
- 4) Albugo is _____ fungi.
a) Obligate parasite
b) Facultative parasite
c) Saprophyte
d) None of the above
- 5) Ascospores are produced within sac like structure is called _____
a) Asci
b) Basidium
c) Both a and b
d) None of the above



2. Answer **any seven** of the following : **14**
- 1) What are fungi ?
 - 2) Write the classification of *Mucor*.
 - 3) Sketch and label thallus structure of *Saccharomyces*.
 - 4) What is Lichen ?
 - 5) What is plant pathology ?
 - 6) What is mycopesticide ?
 - 7) Write the host and causal organism of *citrus canker*.
 - 8) Write the causal organism of Grain smut of *Jowar*.
 - 9) Write the symptoms of Little leaf of *Brinjal* (any four).
3. A) Attempt **any two** of the following : **10**
- 1) Write the general characteristics of fungi.
 - 2) Write the Asexual reproduction in *Mucor*.
 - 3) Write the economic importance of Lichen.
- B) Explain the role of fungi in industry. **4**
4. Attempt **any two** of the following : **14**
- 1) Explain the reproduction in *Saccharomyces*.
 - 2) Write the significance of *mycorrhiza*.
 - 3) Write the symptoms and control measures of yellow vein mosaic of Bendi.
5. Attempt **any two** of the following : **14**
- 1) Explain the reproduction in *Albugo*.
 - 2) Write the mode of disease transmission.
 - 3) Write the symptoms and control measures of Grain smut of *Jowar*.
-



2. Answer **any seven** of the following : **14**
- I) Sketch and label megasporophyll of *Cycas*.
 - II) What is sporophyte ?
 - III) Cyclic representation of alternation of generation in bryophyta.
 - IV) Give the systematic position of *Selaginella*.
 - V) Give the function of scaly leaves of *Cycas*.
 - VI) Write occurrence of *Riccia*.
 - VII) Give the function of rhizoids in *Riccia*.
 - VIII) Comment on rhizophore.
 - IX) Give the economic importance of bryophyta.
3. A) Answer **any two** of the following : **10**
- I) Give the outline of classification of gymnosperm proposed by Sporne.
 - II) Describe the external morphology of *Selaginella* sporophyte.
 - III) Explain the structure of antheridium of *Riccia*.
- B) Give the general characters of Pteridophyta. **4**
4. Answer **any two** of the following : **14**
- I) Describe the structure of T.S. of *Selaginella* stem.
 - II) Explain the structure of male cone of *Cycas*. Add a note on external morphology of pollen grain of *Cycas*.
 - III) Give unifying general characters of archegoniates.
5. Answer **any two** of the following : **14**
- I) Give economic importance of gymnosperm.
 - II) Give the outline of classification of pteridophyta proposed by GM Smith.
 - III) Describe the external morphology of *Ricciathallus*.
-



- 6) Define storage.
- 7) Define personality.
- 8) Who developed psychoanalysis ?
- 9) Who was the founder of IQ test ?

3. A) Short Notes **(Any two)** **10**
- 1) Parallel Distributed Processing Model.
 - 2) Sensory Memory.
 - 3) Decay theory.
- B) Discuss on Long Term Memory. **4**
4. Answer the following. **(Any two)** : **14**
- 1) Discuss on Divisions of mind.
 - 2) Explain the stages of personality development.
 - 3) Explain the Instinct Approach.
5. Answer the following. **(Any two)** : **14**
- 1) Explain the Humanistic approach.
 - 2) Explain the Arousal Approach.
 - 3) Explain the Short term memory.
-



2. Answer **any seven** of the following : **14**
- 1) Equinox.
 - 2) Nebulae.
 - 3) Members of solar system.
 - 4) Rotation of Earth.
 - 5) Lowest and highest point on the earth surface.
 - 6) Name the earthquake belt.
 - 7) Focus.
 - 8) Corona discontinuity.
 - 9) Geysers.
3. A) Answer **any two** of the following : **10**
- 1) Explain Size and Shape of earth.
 - 2) Explain Structure of Galaxies.
 - 3) Explain Biosphere.
- B) Write note on : **4**
- Seismogram.
4. Answer **any two** of the following : **14**
- 1) Distribution and description of 3rd order relief features.
 - 2) Explain crust, mantle and core.
 - 3) Explain Fissure and Central type of Volcano.
5. Answer **any two** of the following : **14**
- 1) Explain products of Volcano.
 - 2) Describe Nebular hypothesis.
 - 3) Explain effects of earthquake.
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B.Sc. – I (Semester – II) (New CBCS) Examination, 2017
MICROBIOLOGY
Paper No. – III
Microbial Biochemistry and Physiology

Time : 2.30 Hours

Total Marks : 70

Instructions : 1) Figures to the **right** indicate **full** marks.
2) **All** questions are **compulsory**.
3) Draw **neat** labeled diagram **wherever** necessary.

1. Choose and write a **correct** answer from the given alternatives. **14**

- 1) A pentose sugar is _____
 - a) Glucose
 - b) Fructose
 - c) Ribulose
 - d) Lactose
- 2) Glycosidic bond in maltose is
 - a) α 1-4
 - b) β 1-4
 - c) α 1-2
 - d) β 1-2
- 3) An enzyme is generally named by adding _____ to the end of the name of the _____
 - a) “-ase”. Coenzyme
 - b) “-ase”. cell in which it is found
 - c) “-ose”. substrate.
 - d) “-ase”. substrate
- 4) A disaccharide linked by β 1-4 Glycoside linkages is _____
 - a) Lactose
 - b) Sucrose
 - c) Cellulose
 - d) Maltose
- 5) Proteins contain _____
 - a) Only L – α -amino acids
 - b) Only D-amino acids
 - c) DL-Amino acids
 - d) Both (a) and (b)



2. Solve **any seven** of the following (**out of 9**). **14**
- 1) What are coenzymes ?
 - 2) How temperature affects the enzyme activity ?
 - 3) What is the function of rRNA ?
 - 4) What is apoenzyme ?
 - 5) What is the role of NaCl in media ?
 - 6) Define growth in bacteria.
 - 7) What do you mean by anabolism ?
 - 8) Name the indicators used in culture media.
 - 9) Which monomers are present in lactose sugar ?
3. A) Attempt **any 2**. **10**
- 1) Growth phases of bacteria.
 - 2) Lock and key hypothesis.
 - 3) High energy compounds.
- B) Types of enzymes. **4**
4. Attempt **any 2**. **14**
- 1) Structure of DNA.
 - 2) Nutritional types of microorganisms based on carbon and energy sources.
 - 3) TCA cycle.
5. Attempt **any 2**. **14**
- 1) Factors affecting enzyme activity.
 - 2) EMP pathway.
 - 3) Structure of proteins.
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B.Sc. I (Semester – II) (New CBCS) Examination, 2017
PSYCHOLOGY
Paper – IV : Human Development

Time : 2½ Hours

Max. Marks : 70

N.B. : 1) **All questions are compulsory.**
2) **Figures to the right indicate full marks.**

1. Write multiple choice.

14

- 1) _____ theory of adult development to the notion of life course.
a) Gould b) Levinson c) Croufer d) Fried
- 2) _____ age most people developed improved relationship with their parents.
a) Adult b) Old c) Middle d) Any other
- 3) The _____ are major traits termed as the NEO model of personality.
a) five b) three c) four d) six
- 4) A _____ development a life stage theory of career development.
a) Erikson b) Giften c) Super d) Any other
- 5) Our each of the five senses undergoes change
a) Early adulthood b) Late adulthood
c) Middle age d) Childhood
- 6) _____ percent of American get married at their lives in early adulthood.
a) 90 b) 95 c) 80 d) 75
- 7) _____ is equally important to Levinson theory.
a) Life span b) Life structure c) Life style d) Any other
- 8) The _____ stage is associated primary with early adulthood.
a) Exploitation b) Exploration c) Observation d) Any other

P.T.O.



- 9) The _____ of Erikson crisis is the major issue of young adulthood is intimacy Vs Isolation.
a) Third b) Sixth c) Fifth d) Seven
- 10) _____ sensitivity begins to decline at about age 50.
a) Vision b) Taste c) Audition d) Any other
- 11) According to _____ wisdom defined as the ability to make the best choices in life.
a) Peak b) Stark c) Troll d) Jung
- 12) _____ people need more middle care than younger ones.
a) Middle aged b) Older c) Elder d) Children
- 13) _____ means people should work hard to develop character.
a) Work ethic b) Group ethic
c) Work character d) Any other
- 14) A job that depends on mature judgement may be better handled by an
a) young person b) older person
c) adult person d) any other

2. Write answer in short (**any seven**) :

14

- 1) Which is the main problems of middle aged adult women ?
- 2) What is meant by Trait theories ?
- 3) Write types of marriage.
- 4) What is approximate age of middle age ?
- 5) Give the name of five senses which change in late adulthood.
- 6) Which is best indicator of sibling relationship ?
- 7) Which therapy can be used to after relief to woman in relation to menopause ?
- 8) Definition Divorce.
- 9) What is Death of a spouse ?



3. A) Write short notes (**any two**). 10
- 1) Sexuality in young adulthood.
 - 2) Smell, Taste, Touch in late adulthood.
 - 3) Cognitive development in late adulthood.
- B) Explain health status and problems in middle age. 4
4. Answer **any two** of the following. 14
- A) Describe physical change in old age.
 - B) Describe the normative-crisis model in middle adulthood.
 - C) Explain the pattern work in middle adulthood.
5. Answer **any one** of the following. 14
- A) Explain the Health problem in late adulthood.
- OR
- B) Explain the physical development in middle adulthood.
-



- 6) Define glacier.
 - 7) Define soil.
 - 8) Define Regolith.
 - 9) Define scree.
3. A) Answer **any two** of the following : **10**
- 1) Describe Cliff and Talus. Draw figures.
 - 2) Describe Endogenic earth processes.
 - 3) Describe Exogenic earth process.
- B) Write **any one** of the following : **4**
- 1) Describe Natural Levee. Draw diagram.
 - 2) Describe Mushroom rocks. Draw diagram.
4. Answer **any two** of the following : **14**
- 1) Describe depositional features of glaciers.
 - 2) Describe depositional features of river.
 - 3) Describe Erosional features of wind.
5. Answer **any two** of the following : **14**
- 1) Describe transportation process of wind.
 - 2) Describe agents of weathering.
 - 3) Describe differential weathering. Draw figure. Give two examples.
-



- ix) The infection persisting for longer time is called _____ infection.
a) Chronic b) Acute c) Recurrent d) Systemic
- x) The LTH method of pasteurisation employs _____ temperature.
a) 65° C b) 45° C
c) 71° C d) 62.8° C
- xi) The time period from entry of pathogen to appearance of symptoms is called _____ period.
a) Incubation b) Maturation
c) Latent d) Eclipse
- xii) An individual carrying a pathogen without showing symptoms is known as
a) Carrier b) Fomite
c) Vector d) Vehicle
- xiii) Secondary sewage treatment is _____ process.
a) Chemical b) Physical
c) Physicochemical d) Biological
- xiv) The purification of water uses _____ gas.
a) NH₃ b) SO₂ c) NO₂ d) Cl₂

2. Answer in short (**any seven**) :

14

- i) Write on sources of microorganisms in water.
- ii) Define coliform.
- iii) Write full form of IMVIC.
- iv) What is B.O.D. ?
- v) Define virulence.
- vi) What is pandemic disease ?
- vii) What is active immunity ?
- viii) Write on composition of milk.
- ix) Define pasteurisation.



3. A) Answer in short (**any two**) : **10**
- i) Give an account of sources of contamination of milk.
 - ii) Write on transmission of diseases by ingestion method.
 - iii) Write on primary treatment of sewage.
- B) Write on pasteurisation of milk. **4**
4. Attempt **any two** : **14**
- i) Give an account of purification of water.
 - ii) Write on prophylactic measures for microbial disease.
 - iii) Give an account of transmission of diseases by contact and inhalation method.
5. Attempt **any two** : **14**
- i) Give an account of IMVIC and Eijkman's test.
 - ii) Write on microbial examination of milk.
 - iii) Write on secondary and tertiary treatment of sewage.
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Seat No.	
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**B.Sc. (Part – I) (Semester – II) (Old) Examination, 2017
ENGLISH (Compulsory) (CGPA Pattern)
On Track English Skills for Success**

Time : 2½ Hours

Max. Marks : 70

Instructions : 1) *All questions are compulsory.*
2) *Figures to the right indicate full marks.*

1. Rewrite the following sentences choosing correct alternatives given below them. **14**
- 1) Vivekananda reached Chicago in the month of
a) September b) February c) December d) July
 - 2) J. H. Wright was
a) A Professor at Harvard University
b) A Professor at Oxford University
c) A Professor at Cambridge University
d) None of the above
 - 3) _____ represented the Buddhists of Ceylon at Parliament of Religion in Chicago.
a) Annie Besant b) Protap Chunder Mozoomdar
c) Chakravarti d) Dharmapala
 - 4) According to Palkhivala, violations of economic needs occur from
a) Draught b) Natural disaster
c) Ignorance d) Negligence
 - 5) _____ noted that there are more than two hundred definitions of liberty.
a) Paul Sieghart b) Jerome Shestack
c) Isaiah Berlin d) None of the above
 - 6) _____ missile devastated London in World War II.
a) V2 b) Jupiter c) Agni d) None of the above
 - 7) Wernher von Braun became a cult figure in
a) America b) Germany c) France d) Russia



3. A) Answer **any two** of the following questions : **8**
- 1) What is the message of the poem 'Brahma' ?
 - 2) Is the moon depicted as a challenge or a threat or a comfort in the poem ?
 - 3) Who were 'watchers of the moon' ? What happened to them ?
- B) Answer **any two** of the following questions : **6**
- 1) Your college is organising an essay competition. Write a notice informing the students about the competition, giving details such as day, date, time and venue of the competition.
 - 2) What is an agenda ?
 - 3) What is email ?
4. Answer **any one** of the following : **14**
- A) You are secretary of the Students Union in your college. The Students Union is organising a blood donation camp in the college. Write a notice and agenda of the meeting. Imagine all the details.
 - B) You have got an email letter offering job of probationary officer in a nationalised bank. Write an email letter accepting the offer.
5. Prepare a suitable C.V. for the post of the lecturer in English in a junior college in your city. **14**
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Seat No.	
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B.Sc. I (Semester – II) (CGPA) (Old) Examination, 2017
CHEMISTRY (Paper – II)
Organic Chemistry and Analytical Chemistry

Time : 2½ Hours

Max. Marks : 70

- N.B. :** 1) *All questions are compulsory.*
2) *Draw neat diagrams and give equations wherever necessary.*
3) *Figures to the right indicate full marks.*
4) *Use of logarithmic table and calculator is allowed.*
[Atomic weight : H = 1, C = 12, O = 16, N = 14, Na = 23, Cl = 35.5]

SECTION – I
(Organic Chemistry)

1. Choose the correct alternatives for **each** of the following and rewrite sentences. **5**
- i) Nitrenes are _____
a) Monovalent b) Divalent c) Trivalent d) Tetravalent
- ii) Geometrical isomerism can be shown by compounds having _____
a) C = C b) C = N c) Ring d) All of these
- iii) Cycloalkanes are isomeric with _____
a) Alkanes b) Alkenes c) Alkynes d) Dienes
- iv) The C ≡ C bond length in acetylene is _____
a) 1.20 Å b) 1.34 Å c) 1.54 Å d) 1.09 Å
- v) Aromaticity is explained by _____ rule.
a) Huckel's b) Hund's c) Phase d) Markownikoff's
2. Answer **any five** of the following : **10**
- i) Why alkynes are acidic in nature ?
- ii) What is plane polarised light ? How is it obtained ?
- iii) Explain ozonolysis reaction of ethene.
- iv) State and explain Markownikoff's rule.

P.T.O.



- v) What are dienes? Write their general formula.
- vi) Define and explain addition reaction.
- vii) Write different types of arrows with their significance.

3. A) Answer **any two** of the following : **10**

- i) What are reagents ? Discuss different types of reagents with suitable examples.
- ii) What are optical isomers ? Explain optical isomerism in Lactic acid.
- iii) What are alkanes ? Write any two methods for preparation of alkanes.

B) Answer **any one** of the following : **10**

- i) What is aromatic electrophilic substitution reactions ? Explain Friedel Craft's alkylation and acylation reactions.
- ii) Define bond length, bond angle, and bond energy. Describe effect of sp , sp^2 and sp^3 , hybridisation on bond length, bond angle and bond energy.

SECTION – II
(Analytical Chemistry)

4. Select the most correct alternative for the following and rewrite the sentences : **5**

- i) Parachor is defined as the molecular volume of a liquid when it's _____ is unity.
a) dipole b) viscosity
c) surface tension d) none of these
- ii) Which of the following is not a quantitative method ?
a) Carius b) Lassaigens c) Kjeldahl's d) Liebig's combustion
- iii) When salt of calcium and magnesium are present in water it is known as _____ water.
a) soft b) neutral c) hard d) acetic
- iv) The percentage of carbon in cast iron is _____ %.
a) 2.5 – 4.0 b) 0.5 – 2.5 c) 4.0 – 5.0 d) 5.0 – 6.5
- v) The greenhouse effect is observed due to presence of large amount of _____ in the atmosphere.
a) CO b) CO₂ c) NO₂ d) SO₂



5. Answer **any five** of the following : **10**
- i) What are the products of blast furnace in the reduction of iron ?
 - ii) What are the source of oxides of carbon ?
 - iii) Define the term :
 - i) Desalination
 - ii) Biological oxygen demand.
 - iv) What are additive and constitutive properties ?
 - v) Give the reaction occurring while testing nitrogen and sulphur together.
 - vi) What are antacids ? Name four antacid compounds.
 - vii) Give the classification of air pollutants.
6. A) Write short notes on **any two** of the following : **10**
- i) Write short note on fresh water.
 - ii) Froth flotation process.
 - iii) Explain how the distribution law is modified when the solute undergoes association and dissociation in one of the solvent.
- B) Answer **any one** of the following : **10**
- i) What is surface tension ? Explain the principle of drop weight method and describe for determination of surface tension.
 - ii) An organic compound (mol. wt. 180) contains 38.94% carbon and 6.72% hydrogen find its molecular formula.
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Seat No.	
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B.Sc. (Part – I) (Semester – II) (CGPA) (Old) Examination, 2017
PHYSICS (Paper – II)
Heat and Thermodynamics, Electricity, Magnetism and Basic
Electronics

Time : 2½ Hours

Max. Marks : (35+35=70)

- N.B. :** 1) *All questions are compulsory.*
2) *Figures to the right indicate full marks.*
3) *Draw neat diagrams wherever necessary.*
4) *Use of logarithmic table/calculator is allowed.*

SECTION – I
(Heat and Thermodynamics)

1. Select the correct alternative :

5

- i) The zeroth law of thermodynamics leads to the definition of
a) pressure b) volume c) temperature d) entropy
- ii) A short straight line distance between two successive collisions is called
a) Mean free path b) Free path
c) Straight path d) Average path
- iii) The temperature at which Joule Thomson effect changes its sign is called
a) Critical temperature b) Threshold temperature
c) Low temperature d) Inversion temperature
- iv) In refrigerator, liquefied gas used is
a) Ammonia b) Nitrogen
c) Hydrogen d) Helium
- v) The efficiency of heat engine working between temperatures 27°C and 327°C is
a) 0.6 b) 0.5 c) 0.4 d) 0.3

P.T.O.



2. Attempt **any five** of the following :

10

- i) State the first law of thermodynamics.
- ii) Draw a neat diagram of adiabatic demagnetization.
- iii) Give the comparison between diesel engine and otto engine.
- iv) Show that the entropy increases during irreversible process.
- v) What is air conditioning ? State the factors affecting air conditioning.
- vi) Explain the effect of temperature on coefficient of viscosity.
- vii) Give the conditions of reversible process.

3. A) Answer **any two** of the following :

10

- i) Define isothermal change and obtain an expression for work done during this change.
- ii) Explain Linde's air liquefier.
- iii) Explain refrigeration cycle and obtain an expression for coefficient of performance.

B) Answer **any one** of the following :

10

- i) Explain the working of otto engine and obtain an expression for its efficiency.
- ii) Define thermal conductivity and obtain an expression for the coefficient of thermal conductivity.

Calculate the coefficient of thermal conductivity of a gas having specific heat 10^4 J/kg $^\circ$ K. (Coefficient of viscosity = 8.6×10^{-5} poise).

SECTION – II

(Electricity, Magnetism and Basic Electronics)

4. Select the correct alternative from the following :

5

i) Current through LR circuit when it decays is given by the equation

$$a) I = I_0 e^{-\frac{R_t}{L}}$$

$$b) I = I_0 \left(1 - e^{-\frac{R_t}{C}} \right)$$

$$c) I = I_0 \left(1 + e^{-\frac{R_t}{L}} \right)$$

$$d) I = I_0 e^{-\frac{R_t}{C}}$$



- ii) In a purely capacitive circuit, the phase of the alternating current, over the applied e.m.f. is
 - a) Lags by $\pi / 2$
 - b) Leads by $\pi / 2$
 - c) Is out of phase
 - d) In phase
- iii) The time period of oscillations of a ballistic galvanometer is given by the formula
 - a) $T = 2\pi\sqrt{I_0 K}$
 - b) $T = 2\pi I_0 K$
 - c) $T = 2\pi I_0^2 K^2$
 - d) $T = 2\pi\sqrt{I_0 / K}$
- iv) What is the breakdown voltage of a diode ?
 - a) The reverse voltage at which reverse current increases rapidly
 - b) The forward voltage at which the forward current increases rapidly
 - c) The voltage at which the diode burns
 - d) None of these
- v) When both the junctions of a transistor are forward biased, the transistor operates in
 - a) Cut-off region
 - b) Active region
 - c) Saturation region
 - d) Forbidden region

5. Answer **any five** of the following :

10

- i) Define the time constant in LR circuit.
- ii) What is j operator ? Find the magnitude of complex conjugate (4+3j).
- iii) Distinguish between deadbeat galvanometer and ballistic galvanometer.
- iv) Define current and voltage sensitivity of a ballistic galvanometer. What is its unit ?
- v) What is clipping circuit ? Explain how positive clipper works.
- vi) Draw the circuit diagram of common emitter amplifier.
- vii) State advantage of Bridge rectifier.



6. A) Answer **any two** of the following :

10

- i) What is clamper circuit ? Explain positive and negative clamper with its circuit diagram.
- ii) Write note on Owen's bridge.
- iii) A transistor connected in common emitter configuration having current gain $\alpha = 0.99$. What will be change in the collector current for a change in base current to be 0.1 mA ? Find the value of β .

B) Answer **any one** of the following :

10

- i) Obtain the expression for charging and discharging of a condenser through resistance and time constant of CR circuit.
 - ii) Derive an expression for the magnetic induction at a point on the axis due to current carrying circular coil.
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Seat No.	
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**B.Sc. – I (Semester – II) Examination, 2017
(Old) (CGPA Pattern)
STATISTICS (Paper – II)
Descriptive Statistics, Probability and Probability Distributions – II**

Time : 2.30 Hours

Max. Marks : 70

N.B. : 1) Figures to the **right** indicate **full** marks.
2) Answers of **two Sections** should be written in **same** answer book.

**SECTION – I
(Descriptive Statistics, Probability)**

1. Choose the correct alternative : 5
- 1) Two independent variables are
 - a) Positively correlated
 - b) Negatively correlated
 - c) Uncorrelated
 - d) None of these
 - 2) The absolute value of correlation coefficient is
 - a) Zero
 - b) 1
 - c) ≤ 1
 - d) ≥ 1
 - 3) In a regression line of Y on X, $Y = a + bX$, b stands for
 - a) Intercept of the line
 - b) Slope of the line
 - c) Both a) and b)
 - d) None of these
 - 4) If there are two attributes, then the total number of ultimate class frequencies is
 - a) 2
 - b) 4
 - c) 6
 - d) 9
 - 5) Laspeyre's formula uses the weights of the
 - a) Base year
 - b) Current year
 - c) Average of the weights of a number of year
 - d) None of these



2. Answer **any five** of the following : 10
- i) Define Covariance between X and Y. State the effect of change of origin and scale.
 - ii) Define product moment correlation.
 - iii) Define two regression coefficients.
 - iv) Explain the line of regression of Y on X.
 - v) Define fundamental set of frequency.
 - vi) If A and B are independent attributes, then show that $\delta = 0$.
 - vii) Define Laspeyre's and Paasche's price index number.

3. A) Write short note on **any two** of the following : 10
- i) Write short note on index number.
 - ii) What is the effect of change of origin and scale on regression coefficients ?
 - iii) Explain the term association and disassociation with examples.

- B) Answer **any one** of the following : 10
- i) Obtain the expression for the acute angle θ between the two regression lines. Interpret the results $\theta = 0$, $\theta = \frac{\pi}{2}$.

ii) With usual notation, prove that $R = 1 - \frac{6 \sum d_i^2}{n^3 - n}$.

SECTION – II (Probability Distributions – II)

4. Choose the correct alternative : 5
- 1) For a discrete r.v. X, the moment about mean is called _____ moment.
 - a) Raw
 - b) Factorial
 - c) Central
 - d) None of these
 - 2) If X is a discrete r.v. with p.m.f. $p(x)$, then $E\left(\frac{1}{x}\right)$ is given by
 - a) $\sum \frac{x}{p(x)}$
 - b) $\sum \frac{p(x)}{x}$
 - c) $\frac{1}{\sum xp(x)}$
 - d) $\sum xp(x)$



- 3) If X and Y are two independent random variables, then $V(X - Y) =$ _____
- a) $V(X) + V(Y) - 2Cov(X, Y)$ b) $V(X) + V(Y) + 2Cov(X, Y)$
c) $V(X) + V(Y)$ d) $V(X) - V(Y)$
- 4) Suppose a fair dice is tossed and r.v. X is defined as the number on top face. Then the probability distribution of r.v. can be obtained using _____ distribution.
- a) One point b) Discrete uniform
c) Bernoulli d) Binomial
- 5) Number of parameters of hypergeometric distribution is
- a) 1 b) 2 c) 3 d) many

5. Answer **any five** of the following : 10

- i) Define expectation of a function of r.v. X.
- ii) Define second factorial moment.
- iii) If X and Y are two independent random variables with $E(X) = 5, V(X) = 10, E(Y) = 0, V(Y) = 1$, then find $V(3X - 5Y)$.
- iv) If the joint p. m. f. of r.v. (X, Y) is $P(x, y) = K(2x + 5y) \quad x = 1, 2 \quad y = 1, 2$
Find K.
- v) State the mean and variance of one point distribution.
- vi) Let X has Bernoulli distribution with parameter p. Find mean of X.
- vii) Give two real life situations of binomial distribution.

6. A) Answer **any two** of the following : 10

- i) The joint p.m.f. of r.v. (X, Y) is given by

$$P(x, y) = \frac{|x + y|}{8} \quad x = -1, 0, 1, \quad y = -1, 0, 1$$

Find :

- a) Marginal distribution of X and Y.
 - b) $E(X+Y)$.
- ii) If the p.g.f. of r.v. X is given by $P_x(S) = \frac{s^2 + s + 1}{3}$ find mean and variance of X.
- iii) Find mean and variance of discrete uniform distribution.



B) Answer **any one** of the following :

10

i) The joint p.m.f. of r.v. (X, Y) is given by

x \ y	0	1	2	3
0	C	2C	3C	4C
1	2C	4C	6C	8C
2	3C	6C	9C	12C

Find :

- C
 - $P(X = Y)$
 - $P(X+Y \leq 1)$
 - Conditional distribution of X given $Y = 2$
 - $E(X/Y=2)$.
- ii) Define binomial distribution. Find p.g.f. of binomial distribution and hence obtain its mean and variance. State the relation between them.
-



2. Attempt **any five** of the following.

10

- 1) Transform equation $x^2 - 4xy + 3y^2 - 10x + 16y + 21 = 0$ when the origin is shifted to $(1, -2)$.
- 2) Find the polar coordinates of the point whose Cartesian co-ordinates are given as $A(-1, 1)$.
- 3) Find the angle between the lines whose direction ratios are $(3, -6, 2)$ and $(12, 4, -3)$.
- 4) Find the equation of sphere having the join $A(1, -2, 3)$ and $B(-3, 1, 2)$ as a diameter.
- 5) Find the centre and radius of sphere $x^2 + y^2 + z^2 - 4x - 6y + 8z + 4 = 0$.
- 6) Find the distance of the point $(1, 1, 4)$ from the plane $3x - 6y + 2z + 11 = 0$.
- 7) Identify conic given by the following equation
 $5x^2 - 6xy + 5y^2 + 22x - 26y + 29 = 0$.

3. A) Attempt **any two** of the following.

10

- 1) If by rotation of axes the expression $\alpha x + \beta y$ changes to $\alpha'x' + \beta'y'$ then prove that $\alpha^2 + \beta^2 = \alpha'^2 + \beta'^2$.
- 2) Find the equation of plane passing through three points $P(3, 4, 2)$, $Q(4, 6, 5)$, $R(8, 2, 9)$.
- 3) Show that the plane $2x - 2y + z + 12 = 0$ touches the sphere $x^2 + y^2 + z^2 - 2x - 4y + 2z = 3$ and find the point of contact.

B) Attempt **any one** of the following.

10

- 1) If by rotation of axes, the expression $ax^2 + 2hxy + by^2$ becomes $a'x'^2 + 2h'x'y' + b'y'^2$ then prove $a + b = a' + b'$ and $ab - h^2 = a'b' - h'^2$.
- 2) Show that the equation of the plane tangent to the sphere $x^2 + y^2 + z^2 + 2ux + 2vy + 2wz + d = 0$ at the point $p(x_1, y_1, z_1)$ is $xx_1 + yy_1 + zz_1 + u(x + x_1) + v(y + y_1) + w(z + z_1) + d = 0$ hence find the equation of tangent plane to the sphere $x^2 + y^2 + z^2 - 6x - 4y + 10z + 12 = 0$ at $(2, -1, -1)$.



SECTION – II
(Differential Equations)

1. Choose the correct alternative of the following.

5

1) The integrating factor of the differential equation $(1+x^2) \frac{dy}{dx} + 2xy = \cos x$ is

- a) $\tan^{-1}x$
- b) $\frac{1}{1+x^2}$
- c) $1+x^2$
- d) $\tan^{-1} \frac{1}{x}$

2) The order and degree of the differential equation $\frac{d^2y}{dx^2} + \sqrt{x + \left(\frac{dy}{dx}\right)^3} = 0$ is

- a) 2, 2
- b) 3, 2
- c) 2, 3
- d) 1, 3

3) If the differential equation is of the form $\frac{dx}{dy} + RY = S$ then its integrating factor is

- a) $y \cdot (\text{l.F.}) = \int S \cdot (\text{l.F.}) dx + c$
- b) $x \cdot (\text{l.F.}) = \int S \cdot (\text{l.F.}) dx + c$
- c) $x \cdot (\text{l.F.}) = \int (\text{l.F.}) \cdot S dy + c$
- d) $y \cdot (\text{l.F.}) = \int R \times (\text{l.F.}) dy + c$

4) The general solution of $(D^3 + D^2) y = 0$ is given by

- a) $y = c_1e^x + c_2e^{2x} + c_3e^{3x}$
- b) $y = c_1e^x + (c_2 + c_3)x$
- c) $y = (c_1 + c_2x) + c_3e^{-x}$
- d) $y = c_1x + c_2x^2 + c_3x^3$

5) The equation $\frac{dx}{dy} + P_1x = Q_1x^n$ is the Bernoulli's equation where P_1 & Q_1 are

- a) Functions of y alone
- b) Both functions of x & y
- c) Functions of x alone
- d) Constants



2. Attempt **any five** of the following.

10

1) Solve $(\sin x \cos y + e^{2x})dx + (\cos x \sin y + \tan y) dy = 0$.

2) Solve $\frac{dy}{dx} = e^{x-y} + x^2 e^{-y}$.

3) Solve $y(2xy + e^x)dx = e^x dy$.

4) Solve $\frac{d^4 y}{dx^4} - m^4 y = 0$.

5) Find the particular integral of $(D^2 - 5D + 6) y = e^{4x}$.

6) Solve $\frac{dy}{dx} + \frac{4x}{1+x^2} y = \frac{1}{(1+x^2)^3}$.

7) Find the complementary function $(D^4 - 2D^3 + D^2) y = x^3$.

3. A) Attempt **any two** of the following.

10

1) Solve $(D^3 - 3D^2 + 4D - 2)y = e^x + \cos x$.

2) Solve $y(xy + 2x^2 y^2)dx + x(xy - x^2 y^2)dy = 0$.

3) Solve $3e^x \tan y dx + (1 - e^x) \sec^2 y dy = 0$.

B) Attempt **any one** of the following.

10

1) Explain the method of solving homogeneous differential equation and hence solve $(y^2 + 2xy) dx + (2x^2 + 3xy) dy = 0$.

2) Solve $[(D^2 + 4)^2 (D - 2)^2] y = \cos^2 x$.



Seat No.	
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B.Sc. I (Semester – II) (CGPA) (Old) Examination, 2017
ELECTRONICS (Paper – II)
Electronic Devices and Digital Electronics

Time : 2 ½ Hours

Max. Marks : 70

- N.B. :** 1) **All questions are compulsory.**
2) **Figures to the right indicate full marks.**
3) **Draw neat and labelled diagram wherever necessary.**
4) **Use of log table and calculator is allowed.**

SECTION – I

(Electronic Devices)

1. Select correct alternative of the following :

5

- i) At 0°K, pure semiconducting material acts as _____
a) insulator b) conductor c) semiconductor d) resistor
- ii) The Zener diode usually operated in the _____ region
a) break-over b) break-down c) break-through d) all of these
- iii) The β of a transistor is 199, then the value of α is _____
a) 0.95 b) 0.99 c) 0.905 d) 0.995
- iv) Field effect transistor is a _____
a) High input resistance device b) Unipolar device
c) Voltage controlled device d) All of these
- v) The triac is device which conducts during _____ of input voltage when triggered.
a) Positive half cycle b) Negative half cycle
c) Both positive and negative half cycle d) None of these



2. Answer **any five** of the following : 10
- i) Write diode equation and define volt equivalent of temperature (V_T).
 - ii) Draw the symbol of LED and photo-diode with labels.
 - iii) In a transistor circuit $I_E = 1 \text{ mA}$, $I_C = 0.94 \text{ mA}$. What is the value of I_B ?
 - iv) Draw symbols of BJT and UJT with labels.
 - v) Determine amplification factor (μ) of JFET, having drain resistance = $200 \text{ K}\Omega$ and trans-conductance = $250 \mu \text{ S}$.
 - vi) Draw the I-V characteristics of tunnel diode.
 - vii) What is SCR ? Draw its I-V characteristics.
3. A) Answer **any two** of the following : 10
- i) What is meant by intrinsic and extrinsic semiconductor ? Discuss how N-type semiconductor is developed.
 - ii) Explain construction of Triac
 - iii) Write a note on Varactor diode.
- B) Answer **any one** of the following : 10
- i) Explain how hybrid parameters are utilized for common emitter configuration of transistor, with its equivalent circuit.
 - ii) Explain operation, I-V characteristics and transfer characteristics of N-channel depletion type MOSFET.

SECTION – II

(Digital Electronics)

4. Select correct alternative of the following. 5
- 1) The decimal to BCD encoder has _____ number of inputs.
a) 2 b) 4 c) 8 d) 10
 - 2) The minimum number of flip-flops required for mod-25 counter are _____
a) 5 b) 4 c) 6 d) 3
 - 3) A flip-flop has toggle condition when
a) $J = K = 0$ b) $J = K = 1$ c) $J = 0, K = 1$ d) $J = 1, K = 0$



- 4) The abbreviation of TTL is
 - a) Transistor Transistor Logic
 - b) Transistor Transistor Level
 - c) Transistor Transfer Logic
 - d) Transistor Transfer Level
- 5) The SISO stands for _____
 - a) Serial Interface Serial Output
 - b) Serial Input Serial Output
 - c) Both a and b
 - d) None of these

5. Answer **any five** of the following. **10**

- 1) Define propagation delay time and noise margine.
- 2) Draw the diagram of 2 to 4 decoder.
- 3) Write the truth table of J-K-flip-flop.
- 4) What is combination counter ?
- 5) What is meant by encoder ?
- 6) Draw the diagram of mod-2 counter.
- 7) Name the four types of shift register.

6. A) Answer **any two** of the following. **10**

- 1) Explain TTL NAND gate with diagram.
- 2) Explain 4 to 1 multiplexer with diagram.
- 3) Explain 4-bit SISO shift register with diagram.

B) Answer **any one** of the following. **10**

- 1) Explain decade counter using IC 7490 and draw the timing diagram.
 - 2) Explain 1 to 8 demultiplexer. Draw the diagram and truth table.
-



- 3) Union can handle floating point value.
 - a) True
 - b) False
- 4) ftell() accepts _____ arguments.
 - a) 0
 - b) 2
 - c) 1
 - d) None of these
- 5) If there is more than one member in structure and union then union required more memory than structure.
 - a) True
 - b) False

2. Answer **any five** of the following : **10**

- 1) What is difference between auto and static ?
- 2) Define :
 - a) Local variable
 - b) Global variable
- 3) How pointer is declared and initialize ?
- 4) Give the syntax for nested macro declaration.
- 5) Why typedef is used ? Give one example.
- 6) What is difference between getchar () and gets () ?
- 7) What is difference between array and structure ?

3. A) Solve **any two** of the following : **10**

- 1) How to pass one function as an argument to another function ?
- 2) Explain file opening modes in detail.
- 3) Explain concept pointer handling an array.

B) Solve **any one** of the following : **10**

- 1) Why preprocessor directives are used ? Explain preprocessor directives with its type.
- 2) Write a program to implement copy con command in file.



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**B.Sc. – I (Semester – II) (CGPA Pattern) Examination, 2017
PHYSICAL GEOGRAPHY (Paper – II) (Old)
Climatology**

Time : 2¹/₂ Hours

Max. Marks : 70

- N.B. :** 1) **All questions are compulsory.**
2) **Answers to the both Sections should be written in one answerbook.**
3) **Neat diagrams and maps must be drawn wherever necessary.**
4) **Use of map stencils is allowed.**
5) **Figures to the right indicate full marks.**

SECTION – I

1. Complete the following sentences by choosing correct alternatives : 5
- _____ is the scientific study of the weather conditions over a long period of time.
a) Oceanography
b) Geomorphology
c) Climatology
d) Biogeography
 - CO₂ gas accounts for _____ % volume of the atmosphere.
a) 20.94
b) 78.08
c) 0.008
d) 0.03
 - In normal lapse rate temperature decreases with increasing height at the rate of _____ per Km.
a) 5.5
b) 6.5
c) 7.5
d) 10
 - The high rate of depletion of ozone is due to _____.
a) Global warming
b) CFC
c) Oxygen
d) Nitrogen
 - _____ is the outermost layer of the atmosphere.
a) Exosphere
b) Mesosphere
c) Stratosphere
d) Troposphere

P.T.O.



2. Answer **any five** questions from the following : **10**
- 1) Name four parts of ocean floor.
 - 2) Define ocean currents.
 - 3) Name any two warm ocean currents in Atlantic Ocean.
 - 4) State the three major types of coral reefs.
 - 5) Define ocean deposits.
 - 6) What is meant by spring tides ?
 - 7) What is meant by salinity of ocean water ?
3. A) Write short notes on **any two** of the following : **10**
- 1) Importance of Oceanography.
 - 2) Temperature of ocean water.
 - 3) Coral reefs.
- B) Answer **any one** of the following questions : **10**
- 1) Describe factors affecting on salinity of ocean water.
 - 2) Describe ocean currents in Indian Ocean.
-



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**B.Sc. (Part – I) (Semester – II) Examination, 2017
ZOOLOGY (Paper – II) (CGPA Pattern) (Old)
(Animal Diversity – II and Ecology, Ethology, Evolution and Applied
Zoology)**

Time : 2.30 Hours

Total Marks : 70

- Instructions :** 1) Draw *neat* labeled diagrams *wherever* necessary.
2) Figures to *right* indicate *full* marks.
3) **Two** Sections should be written in **separate** answer book.

**SECTION – I
(Animal Diversity – II)**

1. Rewrite the following sentences choosing **correct** answer from given alternatives : **5**
- 1) The heart of Frog is _____ chambered.
a) 3
b) 4
c) 2
d) 1
 - 2) The digestion in intestine is called _____ digestion.
a) Rectal
b) Intestinal
c) Oral
d) Gastric
 - 3) Gills of bony fishes are covered with _____.
a) Operculum
b) Leathery flap
c) Spiracle
d) Valve
 - 4) The age of fish can be calculated by counting the lines of growth in _____ scales.
a) Placoid
b) Ctenoid
c) Cycloid
d) Glanoid
 - 5) The bunches of egg of frog are called as _____.
a) Clusters
b) Bundles
c) Spawns
d) Groups

P.T.O.



2. Answer **any five** of the following : 10
- i) Ammocoetus larva.
 - ii) Paired fins in fish.
 - iii) Cycloid Scale.
 - iv) Vocal sacs in frog.
 - v) Neotony.
 - vi) Bile.
 - vii) First vertebra of frog.

3. A) Answer **any two** of the following : 10
- i) Describe three germ layers of embryo in frog.
 - ii) Describe the blood of frog.
 - iii) Enlist the general characters of Cyclostomata.

- B) Answer **any one** of the following : 10
- i) Describe the brain of frog and its functions of various parts.
 - ii) Describe the reproductive systems in frog.

SECTION – II
(Ecology, Ethology, Evolution and Applied Zoology)

1. Rewrite the following sentences choosing **correct** answer from given alternatives : 5
- 1) _____ are also called as tertiary consumers.
- | | |
|-----------|--------------|
| a) Tigers | b) Elephants |
| c) Frogs | d) Rabbits |
- 2) The study of gradual changes in animals is called as _____
- | | |
|--------------|--------------|
| a) Ecology | b) Ethology |
| c) Economics | d) Evolution |
- 3) _____ is considered as a social insect.
- | | |
|--------------|--------------|
| a) Honey bee | b) Cockroach |
| c) Silk moth | d) Housefly |



4) The domestication of milk producing animals is called _____

- a) Dairy science
- b) Apiculture
- c) Vermiculture
- d) Piggary

5) _____ is an abiotic factor of an ecosystem.

- a) Water
- b) Bacteria
- c) Protozoans
- d) Fish

2. Answer **any five** of the following : **10**

- i) Neutralism.
- ii) Ecology.
- iii) Food chain.
- iv) Sericulture.
- v) Succession.
- vi) Milk.
- vii) Naupial Flight.

3. A) Answer **any two** of the following : **10**

- i) Describe the courtship behavior in weaver birds.
- ii) Describe the ecological pyramids.
- iii) With suitable example explain the phenomenon Camouflage.

B) Answer **any one** of the following : **10**

- i) Describe the abiotic and biotic factors of grassland ecosystem.
 - ii) Give an account of anatomical evidences of evolution.
-



Seat No.	
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B.Sc. – I (Semester – II) (CGPA) (Old) Examination, 2017
BOTANY (Paper – II)
Gymnosperms and Angiosperms, Cell Biology, Genetics and Plant Biotechnology

Time : 2½ Hours

Max. Marks : 70

- Instructions :** 1) **All questions are compulsory.**
2) Draw **neat** and labelled diagrams **wherever necessary.**
3) Figures to the **right** indicate **full marks.**

SECTION – I

(Gymnosperms and Angiosperms)

1. Rewrite the following sentences by choosing correct alternatives : 5
- 1) In gymnosperms the seeds are
 - a) Naked
 - b) Enclosed
 - c) Half enclosed
 - d) Both a) and b)
 - 2) Cycas belongs to class
 - a) Coniferopsida
 - b) Cycadopsida
 - c) Gnetopsida
 - d) Conipsida
 - 3) _____ are necessary whorls of flower.
 - a) Androecium and gynoecium
 - b) Calyx and corolla
 - c) Androecium and calyx
 - d) Gynoecium and corolla
 - 4) _____ is a type of aggregate fruit.
 - a) Pepo
 - b) Pome
 - c) Regma
 - d) Etario of berries
 - 5) Capsicum annum belongs to the family
 - a) Annonaceae
 - b) Solanaceae
 - c) Convolvulaceae
 - d) Caesalpinaceae



2. Answer **any five** of the following : **10**
- i) Mention any two demerits of Bentham and Hooker's system.
 - ii) Define complete flower.
 - iii) Structure of gynoecium.
 - iv) What is actinomorphic flower ?
 - v) Sketch and label corymb inflorescence.
 - vi) Define placentation.
 - vii) Economic importance of Tamarindus Indica.
3. A) Answer **any two** of the following : **10**
- i) Sketch, label and describe the T. S. of Cycas leaflet.
 - ii) Write any ten salient features of Angiosperms.
 - iii) Define aestivation. Describe any four types of aestivation.
- B) Answer **any one** of the following : **10**
- i) Sketch, label and describe the verticillaster and hypanthodium type/forms of inflorescence.
 - ii) Give the distinguishing characters and economic importance of any two following families :
 - a) Amaryllidaceae
 - b) Annonaceae
 - c) Nyctaginaceae.

SECTION – II

(Cell Biology, Genetics and Plant Biotechnology)

4. Rewrite the sentence by choosing correct alternative : **5**
- 1) _____ is multidisciplinary science.
 - a) Biotechnology
 - b) Botany
 - c) Zoology
 - d) Chemistry
 - 2) _____ character is not expressed in F1 generation.
 - a) Dominant
 - b) Recessive
 - c) Complementary
 - d) Subdominant



- 3) _____ is the controlling centre of the cell.
- | | |
|------------|--------------------|
| a) Nucleus | b) Ribosomes |
| c) E. R. | d) Golgi apparatus |
- 4) _____ is called resting phase.
- | | |
|---------------|--------------|
| a) Interphase | b) Metaphase |
| c) Anaphase | d) Telophase |
- 5) _____ is present in prokaryotic cell.
- | | |
|----------------|-------------------|
| a) Nucleoid | b) Mitochondrion |
| c) Chloroplast | d) 80 S ribosomes |

5. Answer **any five** of the following : **10**

- i) Write any two functions of mitochondrion.
- ii) What happens during G1 phase of cell cycle ?
- iii) Define dominant and recessive characters.
- iv) Draw neat labeled diagram of chloroplast.
- v) Define biofertilizer.
- vi) Mention any two applications of biotechnology in agriculture.
- vii) Define supplementary genes.

6. A) Write short notes on **any two** of the following : **10**

- i) Structure of cell membrane (Singer Nicholson's model).
- ii) Prophase and Telophase of Mitosis.
- iii) Role of BGA in agriculture.

B) Answer **any one** of the following : **10**

- i) What is genetics ? Explain dihybrid cross with suitable example.
 - ii) Discuss in brief the glyoxylate cycle.
-



SLR-C – 75

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B.Sc. – I (Semester – II) (Old-CGPA Pattern) Examination, 2017
GEOLOGY (Paper – II)
Introduction to General Geology and Physical Geology

Time : 2.30 Hours

Total Marks : 70

- Instructions :** 1) **All** questions are **compulsory**.
2) Draw **neat** diagrams **wherever** necessary.
3) Figures to the **right** indicate **full** marks.
4) Write both the Sections in **same** answer sheet.

SECTION – I
(Introduction to General Geology)

1. Write a correct answer from given **four** alternatives.

5

- 1) Planet Jupiter has _____ satellites.
a) 10 b) 12 c) 15 d) 2
- 2) Earthquake waves are of _____ types.
a) 3 b) 4 c) 5 d) 6
- 3) Gutenberg discontinuity is at a depth of _____ km.
a) 5000 b) 6100 c) 2900 d) 7000
- 4) Average density of earth is _____ gm/cc.
a) 4.2 b) 5.5 c) 2.8 d) 3.8
- 5) The radius of earth is _____ km.
a) 7800 b) 6371 c) 9371 d) 8371

P.T.O.



2. Answer **any five** of the following : **10**
- 1) Earth planet.
 - 2) Epicenter.
 - 3) Define volcano.
 - 4) What is earthquake ?
 - 5) Rotation of earth.
 - 6) Name the gases product of volcano.
 - 7) Seismograph diagram.
3. A) Write short note on **any two** of the following : **10**
- 1) Explain hydrosphere.
 - 2) Explain central and fissure eruption.
 - 3) Explain prediction of earthquake.
- B) Answer **any one** of the following : **10**
- 1) Explain internal structure of the earth and discontinuities.
 - 2) Explain solar system.

SECTION – II
(Introduction to Physical Geology)

1. Fill in the blanks with **correct** answers from the given options. **5**
- 1) Faceted rocks with polished surfaces are developed by _____ erosion.
a) Glacier b) River c) Sea d) Wind
 - 2) Wind is active agent in _____ region.
a) Cold and humid b) Warm and humid
c) Dry and arid d) None of these
 - 3) The glacial drift carried on the surface and deposited along the margins in the form of Ridges is called _____ moraines.
a) Medial b) Lateral
c) Terminal d) Downward



- 4) Hydration is a process of _____ H_2O .
- a) Addition
 - b) Evaporation
 - c) Removal
 - d) Ionization
- 5) The surface/level on the earth surface above which snow is present permanently throughout year, called as _____
- a) Snow cap
 - b) Snow line
 - c) Snow sheet
 - d) Piedmont

2. Answer **any five** of the following : **10**

- 1) Define drumlins.
- 2) Describe Yardangs.
- 3) Describe ocean tides.
- 4) What is exogenous and endogenous processes ?
- 5) Draw soil profile.
- 6) What is regolith ?
- 7) Give the names of types of glaciers.

3. A) Write short notes on **any two** of the following : **10**

- 1) Sand dunes and their types.
- 2) Mushroom and Pedestal rock.
- 3) U shaped and Hanging valley.

B) Answer **any one** of the following : **10**

- 1) Define weathering. Describe various processes of physical weathering.
 - 2) Describe different erosional features of river.
-



2. Answer **any five** of the following : 10
- i) Define high energy compounds.
 - ii) Define cofactors of enzyme and give one example.
 - iii) What is the role of starch in culture media ?
 - iv) Describe in short energetics of EMP cycle.
 - v) Define autotroph.
 - vi) List different complex lipids.
 - vii) Write the differences between anabolism and catabolism.
3. A) Write short notes on **any two** of the following : 10
- i) Primary and secondary structure of proteins.
 - ii) Different types of enzymes.
 - iii) Polysaccharides.
- B) Answer **any one** of the following : 10
- i) Write an essay on EMP pathway.
 - ii) Describe in detail nutritional types of micro-organisms based on carbon and energy source.

SECTION – II
(Applied Microbiology – I)

1. Rewrite the following sentences by selecting correct answer (alternative) : 5
- i) _____ is an indicator of fecal pollution of water.
 - a) E. coli
 - b) Proteus Vulgaris
 - c) Pseudomonas spp.
 - d) Klebsiella spp.
 - ii) _____ is a milk protein.
 - a) Pepsin
 - b) Caesin
 - c) Insulin
 - d) Trypsin
 - iii) Diseases which affect large number of people within short time are _____ diseases.
 - a) Endemic
 - b) Epidemic
 - c) Pandemic
 - d) Sporadic



iv) If infection is confined to particular organ, it is known as _____ infection.

- a) Congenital
- b) Local
- c) Generalized
- d) Cross

v) Respiratory diseases are transmitted by _____ method.

- a) Inhalation
- b) Ingestion
- c) Inoculation
- d) Contact

2. Answer **any five** of the following questions : **10**

- i) What are carriers ?
- ii) What is mortality rate ?
- iii) What is impaction technique ?
- iv) List four diseases transmitted through ingestion method.
- v) What do you mean by pandemic diseases ?
- vi) What is Ejackman test ?
- vii) What is droplet nuclei ?

3. A) Write short notes on **any two** of the following : **10**

- i) MPN test
- ii) Sources of contamination of milk
- iii) Inhalation and inoculation as methods of disease transmission.

B) Answer **any one** of the following : **10**

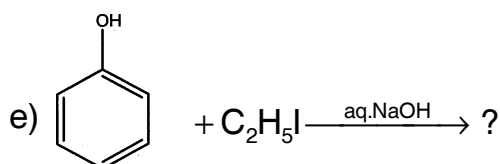
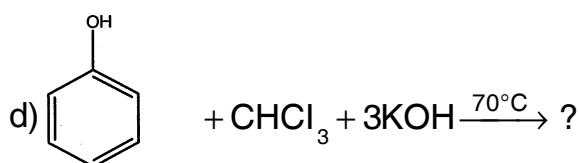
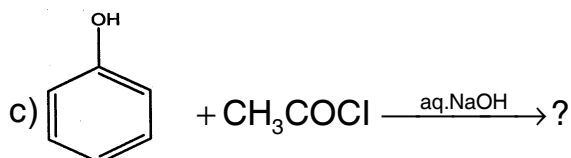
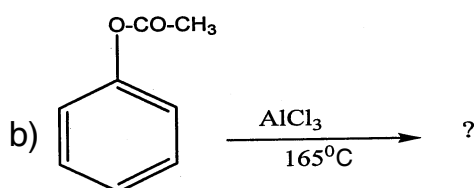
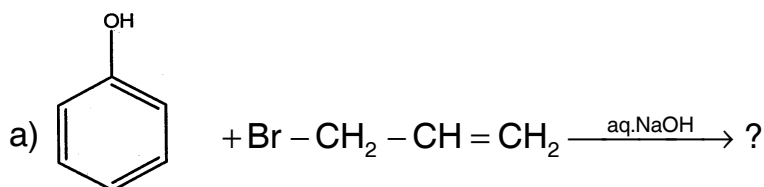
- i) Write an essay on 'Tests for coliforms'.
 - ii) Write an essay on 'Municipal water purification'.
-



3. A) Answer **any two** of the following :

10

i) What are products of the following :



ii) Explain Knoevenagel reaction with its mechanism.

iii) What is trihydric alcohol ? How glycerol is prepared from oil and fat ?

Write uses of glycerol.

B) A compound having the formula C₈H₁₀O is subjected to Zeisel's method for estimating methoxy group. It was found that 1.147 × 10⁻⁴ Kg compound forms 2.21 × 10⁻⁴ Kg of silver iodide. Calculate the percentage and number of -OCH₃ group in the compound.

4

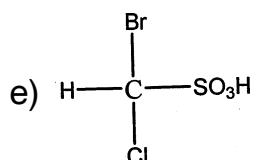
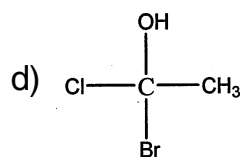
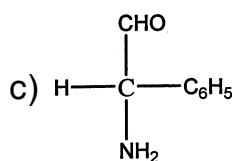
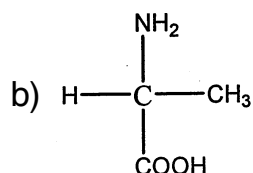
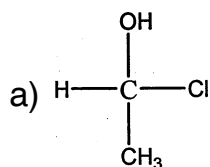


4. Answer **any two** of the following : 14

- i) Define the terms with example : bathochromic shift, hypsochromic shift, hypochromic shift and hyperchromic shift.
- ii) What is the principle of UV spectroscopy ? Explain different types of electronic transitions involved in UV spectroscopy.
- iii) Why phenols are acidic in nature ? Write notes on Claisen rearrangement and Gattermann synthesis.

5. Answer **any two** of the following : 14

- i) What are aldoximes ? Explain the geometrical isomerism of aldoximes. How is the configuration of aldoximes determined ?
- ii) Assign R and S nomenclature to the following isomers.



iii) What happens when

- a) Citric acid is reacted with acetic anhydride.
- b) Succinic acid is treated with $\text{C}_2\text{H}_5\text{OH}/\text{HCl}$.
- c) Acrylic acid is reacted with $\text{Na}/\text{C}_2\text{H}_5\text{OH}$
- d) Malic acid is reacted with HI.
- e) Monochloroacetic acid is reacted with KCN.



Spectroscopic Chart

Woodward's - Fieser's rules for calculating ultraviolet absorption maxima

A) For substituted dienes (Ethanol solution)-

No.	Basic value	λ_{Max} (nm)
1)	Acyclic and heteroannular dienes	214
2)	Homoannular dienes	253
3)	Addition for each substituent	
	a) - R alkyl (including part of carbocyclic ring)	5
	b) - OR (alkoxy)	6
	c) - Cl, - Br	5
	d) - OCOR (acyloxy)	0
	e) - NR ₂ , (N - alkyl)	60
	f) - SR (S - alkyl)	30
	g) - CH = CH - additional conjugation i.e. extending conjugation	30
	h) If one double bond is exocyclic to one ring	5
	i) If exocyclic to two rings simultaneously	10

B) Rules for α , β - Unsaturated Enones (Ethanol Solution)

No.	Basic value	λ_{Max} (nm)
1)	Ketones : $-\overset{\beta}{\underset{ }{\text{C}}}=\overset{\alpha}{\underset{ }{\text{C}}}-\text{CO}-$	
	a) Acyclic or 6 - membered ring	215
	b) 5 - membered ring	202
2)	Aldehydes $-\overset{\beta}{\underset{ }{\text{C}}}=\overset{\alpha}{\underset{ }{\text{C}}}-\text{CHO}$	207
3)	Extended Conjugation	30
	$-\overset{\delta}{\underset{ }{\text{C}}}=\overset{\gamma}{\underset{ }{\text{C}}}-\overset{\beta}{\underset{ }{\text{C}}}=\overset{\alpha}{\underset{ }{\text{C}}}-\text{CO}-\text{etc.},$	
4)	Homodiene component	39
5)	a) If one double bond is exocyclic to one ring	5
	b) If exocyclic to two rings simultaneously	10
6)	Addition for substituents.	



Substituents	Position			
	α	β	γ	δ
a) - R alkyl (including part of carbocyclic ring)	10	12	18	18
b) - OR (alkoxy)	35	30	17	31
c) - OH (hydroxy)	35	30	-	50
d) - SR (thioether)	-	85	-	-
e) - Cl (chloro)	15	12	-	-
f) - Br (bromo)	25	30	-	-
g) - OCOR (acyloxy)	6	6	-	6
h) - NH ₂ , - NHR, - NR ₂	-	95	-	-

Solvent Correction

	Solvent	
a)	Ethanol	0
b)	Methanol	0
c)	Dioxan	- 5
d)	Chloroform	- 1
e)	Ether	- 7
f)	Water	+ 8
g)	Hexane	- 11
h)	Cyclohexane	- 11

Seat
No.

B.Sc. – II (Semester – III) (CGPA Pattern) Examination, 2017
CHEMISTRY (Paper – IV)
Inorganic Chemistry

Time : 2½ Hours

Max. Marks : 70

- N.B. :** i) **All questions are compulsory.**
ii) Draw **neat** labelled diagrams and write equations **wherever necessary.**
iii) Figures to the **right** indicate **full** marks.

1. Select the most correct alternative for **each** of the following and rewrite the sentences :

14

- i) _____ is a complex compound.
a) Ferrous ammonium sulphate
b) Potassium ferrocyanide
c) Potassium aluminium sulphate
d) Sodium cuprous thiosulphate
- ii) The word chelate was first time introduced by
a) G.T. Morgan and H.D.A. Drew b) Alfred Werner
c) L. Pauling d) Sidwick
- iii) _____ is the paramagnetic.
a) Cu^{2+} b) Zn^{2+}
c) Ag^+ d) Au^+
- iv) Boron trifluoride is a Lewis acid because, it is
a) Electron pair donor b) H^+ donor
c) Electron pair acceptor d) None of these
- v) From the following _____ will shows geometrical isomerism.
a) Ma_4 b) Ma_6
c) $\text{M}(\text{AA})_2$ d) $\text{M}(\text{AB})_2$

P.T.O.



2. Solve **any seven** of the following : **14**
- i) Define complex salt with example.
 - ii) Show the *d* and *l* isomers in $[\text{Co}(\text{en})_3]^{3+}$.
 - iii) Draw the structure of $\text{CoCl}_3 \cdot 5\text{NH}_3$ by using Werner theory.
 - iv) Define co-ordination number and co-ordination sphere.
 - v) State any two applications of EDTA.
 - vi) Give the Lewis acid and base concept.
 - vii) What are basic characteristics of soft base ?
 - viii) Calculate magnetic moment of the Cu^{2+} .
 - ix) Give the oxidation state of Ni in $\text{Ni}(\text{CO})_4$ and Fe in $[\text{Fe}(\text{CO})_2(\text{NO})_2]$.
3. A) Write a short note on **any two** of the following : **10**
- i) Colour property due to d-d transition.
 - ii) Geometrical isomerism with CN=4.
 - iii) Postulates of Werner theory.
- B) Compare first transition series with second and third transition series w.r.t. their reactivity and oxidation state. **4**
4. Solve **any two** of the following : **14**
- i) Discuss HSAB principle and its application.
 - ii) Explain the complex formation of copper with weak field ligands with suitable example. Comment on stability and magnetic property of the complex.
 - iii) What do you mean by paramagnetism ? Explain the magnetic character in 3d transition elements.
5. Solve **any two** of the following : **14**
- i) Define oxidation number. Explain oxidation states of 3d transition elements.
 - ii) Discuss the applications of DMG as a chelating agent.
 - iii) Distinguish between double salt and complex salt.
-



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B.Sc. – II (Semester – III) (CGPA) Examination, 2017
PHYSICS (Paper – III)
General Physics, Heat and Sound

Time : 2½ Hours

Max. Marks : 70

- Instructions:** i) *All questions are compulsory.*
ii) *Figures to **right** indicate **full** marks.*
iii) *Draw **neat** diagrams **wherever** necessary.*
iv) ***Use** of calculator or log table is **allowed**.*

1. Choose the correct alternative. **14**
- 1) Curl of a vector field is
a) Vector
b) Scalar
c) Always zero
d) Always one
- 2) If τ_1 is the precessional torque then the rate of precession ϕ is
a) $\phi = I\omega\tau_1$
b) $\phi = \frac{\tau_1}{\omega}$
c) $\phi = \frac{\tau_1}{|I\omega|}$
d) $\phi = \frac{|I\omega|}{\tau_1}$
- 3) If $\vec{A} \cdot (\vec{B} \times \vec{C}) = 0$ then the vectors \vec{A} , \vec{B} and \vec{C} are
a) Not coplanar
b) Equal
c) Coplanar
d) All zero
- 4) If the lower end of loaded spring has extension of x then the C.G. of the spring is lowered by
a) x
b) $x/2$
c) $2x$
d) $x/4$
- 5) The dimensions of the coefficient of viscosity are
a) $[M^1 L^{-1} T^1]$
b) $[M^2 L^{-1} T^{-1}]$
c) $[M^1 L^1 T^{-1}]$
d) $[M^{-1} L^{-1} T^{-1}]$
- 6) Entropy remains constant in
a) Adiabatic process
b) Isothermal process
c) Isochoric process
d) Isolated process



- 7) Entropy is maximum in _____ state.
a) Solid b) Liquid c) Gas d) Semi solid
- 8) The frequency of ultrasonics is
a) Below 20 Hz b) Above 20,000 Hz
c) 20 to 20,000 Hz d) 0 to ∞
- 9) The work done in twisting the wire of a spring is stored in the spring as
a) Kinetic energy b) Shearing energy
c) Potential energy d) Binding energy
- 10) The rifling of barrels of guns provides the stability in _____ of the bullet.
a) Speed b) Mass c) Direction d) Force
- 11) For making the hall acoustically good, the reverberation time must be
a) Small b) Optimum c) Large d) Zero
- 12) The CGS unit of viscosity is
a) Kg/m.s b) Poise c) gm.cm/sec. d) N.Sec/m²
- 13) Gyrocompass is used to determine
a) Angle of dip b) Geographic north-south direction
c) Distance between two poles d) Magnetic north-south
- 14) The gradient of scalar field is a
a) Vector b) Scalar c) Constant d) Zero

2. Solve **any seven** of the following :

14

- 1) What is precessional motion ?
- 2) Define scalar triple product.
- 3) What is a flat spiral spring ?
- 4) Define coefficient of viscosity.
- 5) Explain the concept of entropy.
- 6) What are the properties of ultrasonic waves ?
- 7) State and explain Lanchester's rule.
- 8) What do you mean by (a) neutral surface (b) neutral axis.
- 9) What is a cantilever ?



3. A) Solve **any two** of the following : **10**
- 1) For a vector triple product, show that
$$\vec{A} \times (\vec{B} \times \vec{C}) = \vec{B}(\vec{A} \cdot \vec{C}) - \vec{C}(\vec{A} \cdot \vec{B})$$
 - 2) Derive an expression for bending moment of an uniformly bent beam.
 - 3) Define entropy. Derive an expression for entropy of a perfect gas in terms of its pressure, volume and specific heat.
- B) Determine the critical velocity of a disc of radius 30 cm rolling over a horizontal surface ($g = 980 \text{ cm/sec}^2$). **4**
4. Solve **any two** of the following : **14**
- 1) Derive an expression for the periodic time of a gyrostatic pendulum.
 - 2) Explain the method of piezoelectric effect for production of ultrasonic waves.
 - 3) Describe Searle's method for determining the viscosity of highly viscous liquid.
5. Solve **any two** of the following : **14**
- 1) What is gradient of a scalar ? Explain its physical significance.
 - 2) Explain pressure microphone with neat diagram.
 - 3) Define reverberation time. What are the requirements of good acoustics ?
-



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B.Sc. – II (Semester – III) (CGPA) Examination, 2017
PHYSICS (Paper – IV)
Electronics

Time : 2.30 Hours

Max. Marks : 70

- N.B. :** 1) **All the questions are compulsory.**
2) Figures to the **right** indicate **full marks.**
3) **Neat diagram must be drawn whenever necessary.**
4) **Use of logtable and calculator is allowed.**

1. Select the correct alternative from the following : 14
- i) The process of injecting a fraction of output energy back to input is known as _____
a) Output b) Gain c) Feedback d) Input
- ii) In double ended input and output differential amplifier, the output is taken _____
a) Between collector and base
b) Across two collectors
c) Between either collector and ground
d) Between either base and ground
- iii) In RC coupled amplifier, the voltage gain over mid frequency range _____
a) Changes abruptly with frequency
b) Is constant
c) Changes uniformly with frequency
d) None of these
- iv) An oscillator employs _____ feedback.
a) Positive
b) Negative
c) Neither positive nor negative
d) Data insufficient

P.T.O.



2. Answer **any seven** of the following : 14
- i) What is differential amplifier ? State its various modes of operations.
 - ii) Explain frequency response curve of amplifier.
 - iii) Draw potential divider circuit.
 - iv) What is Barkhausen criterion for sustained oscillations.
 - v) What do you mean by AF and RF oscillators ?
 - vi) In UJT, $R_{B1} = 7K\Omega$, $R_{B2} = 5K\Omega$.
Find intrinsic stand off ratio (η).
 - vii) Draw logical diagram of De Morgan's second theorem.
 - viii) State any two uses of CRO.
 - ix) An unknown AC voltage is fed to the vertical input of CRO. The volts/div knob on position 8 volt/div. The number of vertical division are 10. Calculate peak to peak voltage.
3. A) Answer **any two** of the following : 10
- i) What is feedback in an amplifier ? Discuss positive and negative feedback in an amplifier.
 - ii) Write note on UJT.
 - iii) What do you mean by line regulation and voltage regulation ? Explain.
- B) The Hartly oscillator has $L_1 = 750\mu H$, $L_2 = 750\mu H$, $M = 75\mu H$ and $C = 150PF$. Calculate frequency of an oscillator. 4
4. Answer **two** of the following : 14
- i) Describe in detail two stage RC coupled amplifier. What are advantages ?
 - ii) Draw a neat circuit diagram of Colpitt's oscillator. Explain its operation.
 - iii) Explain the construction and working of FET. How it works as VVR ?
5. Answer **two** of the following : 14
- i) What is flip-flop ? Explain construction and working of J-K flip-flop.
 - ii) Draw the neat diagram of transistor series voltage regulator. Discuss its operation. Also explain the need of regulated power supply.
 - iii) Draw block diagram of digital multimeter and explain its applications.
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Seat No.	
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**B.Sc. – II (Semester – III) (CGPA Pattern) Examination 2017
STATISTICS (Paper – III) Continuous Probability Distributions – I**

Time : 2.30 Hours

Max. Marks : 70

Instructions : 1) *All questions are compulsory and carry equal marks.*
 2) *Figures to the right indicate full marks.*

1. Choose the correct alternative :

14

i) If the joint p.d.f. of continuous bivariate r.v.(X, Y) is

$$f(x, y) = (x + y) \quad ; \quad 0 < x, y < 1$$

$$= 0 \quad ; \quad \text{otherwise}$$

then the marginal p.d.f. of r.v.X is

- a) $x + 0.5$ b) $y + 0.5$ c) $2x$ d) $2y$

ii) The conditional expectation of X given $Y = y$ i.e. $E(X|Y = y)$

- a) may be a function of y b) always a function of y
 c) always a function of x d) may be a function of x

iii) If X and Y are two independent r.v. such that $E(X) < \infty$, $E(Y) < \infty$ then

- a) $E[[X - E(X)][Y - E(Y)]] = 0$ b) $E(XY) = E(X) E(Y)$
 c) $E[[X - E(X)][Y - E(Y)]] = 1$ d) both (a) and (b) are true

iv) Consider the statements

$$E[E(X|Y = y)] = E(X) \dots\dots (I)$$

$$E[X|Y = y] = E(X) \dots\dots\dots (II) \text{ then}$$

- a) always (I) is true
 b) always (II) is true
 c) always (II) is false
 d) (I) is always true and (II) is true if X and Y are independent



- v) For X to be a continuous r.v. with p.d.f. $f(x)$, which of the following statements is false ?
- it can take all possible values between certain limits
 - the different values of X cannot be put in one-to-one correspondence with a set of positive integers
 - it satisfies two conditions i) $f(x) \geq 0; \forall x$ ii) $\int_{-\infty}^{+\infty} f(x)dx = 1$
 - it is a real-valued function defined on a sample space, which can take any integral value
- vi) If a r.v. X has mg.f. $M_x(t) = (1 - 2t)^{-1}, |t| < \frac{1}{2}$ then the mean and variance of X are
- (4, 2)
 - (2, 4)
 - (2, 2)
 - (4, 4)
- vii) If $Y = F(x)$ is a c.d.f. of a continuous r.v. then distribution of Y is
- $U(0, 1)$
 - exponential
 - discrete uniform
 - degenerate at 0
- viii) If X has p.d.f.
- $$f(x) = 0.5 \quad ; \quad 1 < x < 2$$
- $$= 0 \quad ; \quad \text{otherwise}$$
- then $P(X < 0) =$
- $P(X > 0)$
 - $\frac{1}{4}$
 - $\frac{3}{4}$
 - none of these
- ix) A r.v. X has an exponential distribution with mean 6 then $P[X > 9 | X > 3]$
- $e^{-1.5}$
 - $e^{-0.5}$
 - $e^{-1.0}$
 - $e^{-6.0}$
- x) If X is a continuous r.v. then $P[a \leq X \leq b] =$
- $F(a) - F(b)$
 - $F(b) - F(a)$
 - $1 - F(a) + F(b)$
 - $1 - F(a) - F(b)$
- xi) Let X and Y be i.i.d. exponential r.v. with mean θ
 Let $A : (X + Y)/2$ is exponential r.v. with mean θ
 $B : (X + Y)$ is exponential r.v. with mean θ
- only A is true
 - only B is true
 - both A and B are true
 - both A and B are false
- xii) If the life time of a bulb (X) has the distribution function
- $$F(x) = 0 \quad ; \quad x < 0$$
- $$= 1 - e^{-0.8x} \quad ; \quad x \geq 0 \quad \text{then } E(X) =$$
- $\frac{1}{0.8}$
 - 0.8
 - $\sqrt{0.8}$
 - $(0.8)^2$



iii) The joint p.d.f. of a bivariate r.v. (X, Y) is

$$f(x, y) = \begin{cases} 2 & ; 0 < x < y < 1 \\ 0 & ; \text{otherwise} \end{cases}$$

then find the conditional distribution of Y given X = x.

B) If a continuous bivariate r.v. (X, Y) has the joint density function

$$f(x, y) = \begin{cases} 4x & ; 0 < x < \sqrt{y} < 1 \\ 0 & ; \text{otherwise} \end{cases}$$

find marginal density of Y

4

4. Attempt **any two** :

14

i) Find the distribution function of a r.v. X having p.d.f.

$$f(x) = \frac{1}{2} e^{-|x-5|} \quad ; \quad -\infty < x < \infty$$

ii) Verify whether X and Y are independent random variables if their joint p.d.f. is

$$f(x, y) = \begin{cases} e^{-(x+y)} & ; x > 0, y > 0 \\ 0 & ; \text{otherwise} \end{cases}$$

iii) Find p.d.f. and median of X if its distribution function is

$$F(x) = \begin{cases} 0 & ; x < 0 \\ \frac{x^2}{2} & ; 0 \leq x < 1 \\ 2x - \frac{x^2}{2} - 1 & ; 1 \leq x < 2 \\ 1 & ; x \geq 2 \end{cases}$$

5. Attempt **any two**

14

i) The p.d.f. of a r.v. X is

$$f(x) = \begin{cases} kx & ; 0 \leq x \leq 5 \\ k(10-x) & ; 5 < x \leq 10 \\ 0 & ; \text{otherwise} \end{cases}$$

find the value of k. Calculate $P(5 \leq X \leq 10)$ and $P(2 \leq X)$.

ii) Define a) marginal probability distribution of a r.v. X

b) conditional probability distribution of X given Y = y.

c) conditional expectation of X given Y = y.

iii) Obtain the distribution of $Y = -\frac{1}{\theta} \log_e X$, $\theta > 0$

where X is U(0, 1) r.v. Also define the exponential distribution with scale and location parameters.



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B.Sc. – II (Semester – III) (CGPA Pattern) Examination, 2017
STATISTICS (Paper – IV)
Discrete Probability Distributions and Statistical Methods

Time : 2½ Hours

Total Marks : 70

Instructions: i) **All questions are compulsory.**
ii) Figure to the **right** indicates **full marks.**

1. Choose the correct alternative : **14**
- i) In a Poisson distribution, the second moment about origin is 6, then its third moment about mean is
a) 6 b) 2 c) -3 d) 3
- ii) If X is a Poisson variate with $P[X = 3] = P[X = 4]$, then the variance of a Poisson variate is
a) 4 b) 2 c) 3 d) 5
- iii) If $X \sim P(\lambda)$, then its
a) Mean > Variance b) Mean = Variance
c) Mean = 2 Variance d) Mean < Variance
- iv) If X is a geometric r.v. then $P\left[\frac{X \geq 7}{X \geq 4}\right]$ is equal to
a) $P[X \geq 7]$ b) $P[X \geq 3]$
c) $P[X \geq 7]/P[X \geq 4]$ d) $P[X \geq 4]$
- v) Negative binomial distribution NB (r, p) reduces to geometric distribution with r equal to
a) 0 b) 1
c) ∞ d) None of these



vi) If $X \sim \text{NB}(r, p)$ such that $E(X) = 12$ and $V(X) = 36$, then

a) $r = 3, p = \frac{1}{3}$ b) $r = 36, p = \frac{1}{2}$ c) $r = 12, p = \frac{1}{4}$ d) $r = 6, p = \frac{1}{3}$

vii) Let (X_1, X_2, X_3) be a random vector follows multinomial distribution with usual notations, then $V(X_2)$ is

a) nP_2 b) $3P_2$ c) $nP_2(1 - P_2)$ d) $P_2(1 - P_2)$

viii) In the usual notations, $r_{21.3}$ is equal to

a) $\frac{r_{12}^2 - r_{13}r_{23}}{\sqrt{(1-r_{13}^2)(1-r_{23}^2)}}$ b) $\frac{r_{13}r_{23} - r_{12}^2}{\sqrt{(1-r_{13}^2)(1-r_{23}^2)}}$

c) $\frac{r_{12} - r_{13}r_{23}}{\sqrt{(1-r_{13}^2)(1-r_{23}^2)}}$ d) $\frac{r_{13} - r_{12}}{\sqrt{(1-r_{13}^2)(1-r_{12}^2)}}$

ix) The order of residual $X_{2.13}$ is

a) One b) Two c) Three d) Four

x) The range of partial regression coefficient is

a) 0 to 1 b) -1 to 1 c) 0 to ∞ d) $-\infty$ to ∞

xi) With usual notations, the regression equation X_2 on X_1 and X_3 is

a) $X_2 = b_{12.3}X_1 + b_{32.1}X_3$ b) $X_2 = b_{21.3}X_1 + b_{23.1}X_3$
 c) $X_2 = b_{12.3}X_3 + b_{32.1}X_1$ d) $X_2 = b_{12.3}^2 X_1 + b_{23.1}^2 X_3$

xii) If $R_{1.23} = 0$, then

a) $r_{12} = r_{13} = 0$ b) $r_{23} = 0$
 c) $r_{12} = 0, r_{13} \neq 0$ d) $r_{12} = r_{13} = r_{23} \neq 0$

xiii) If $R_{2.13} = 0$, then all total and partial correlation coefficients involving X_2 are

a) 1 b) 0 c) -1 d) $\frac{1}{2}$

xiv) In usual notations

a) $b_{12.3} + b_{21.3} = r_{12.3}$ b) $b_{12.3} \times b_{21.3} = r_{12.3}$
 c) $b_{12.3} \times b_{12.3} = r_{12.3}$ d) $b_{12.3} \times b_{21.3} = r_{12.3}^2$



2. Attempt **any seven** of the following : 14

- i) If X follows Poisson distribution with parameter λ such that $P(X = 1) = 2 P(X = 2)$, find the p.m.f. of X.
- ii) Find mean of negative Binomial distribution.
- iii) Obtain moment generating function of a multinomial distribution.
- iv) Find probability generating function of geometric distribution.
- v) Define the residual $X_{1.23}$ and state its mean.
- vi) Define partial regression coefficient $b_{12.3}$.
- vii) If $r_{12} = r_{13} = r_{23} = r \neq 1$, then show that $R_{1.23}^2 = \frac{2r^2}{(1+r)}$.
- viii) With usual notations, prove that $1 - R_{1.23}^2 = (1 - r_{12}^2)(1 - r_{13.2}^2)$.
- ix) Show that $b_{12.3} \times b_{21.3} = r_{12.3}^2$.

3. A) Attempt **any two** of the following : 10

- i) Let X be a Poisson variate with parameter λ . If $P[X=5] = \frac{1}{5} p[X=4]$, then find (i) $P(X>3)$ (ii) $P(|X| \geq 2)$.
- ii) Let X be geometric variate with parameter p, then (a) show that $P[X \geq x] = (1 - p)^x$ (b) find the distribution of $X + 1$.
- iii) Obtain the variance of residual $x_{1.23}$.

B) With usual notations, prove that $b_{12.3} \times b_{23.1} \times b_{31.2} = r_{12.3} \times r_{23.1} \times r_{31.2}$. 4

4. Attempt **any two** of the following : 14

- i) If X and Y are two independent Poisson variates, then show that the conditional distribution of X given $(X + Y) = n$ is a Binomial. Also obtain p.g.f. of Poisson distribution.
- ii) State the properties of residual and prove any two of them.
- iii) If X_1 and X_2 are two independent variables with unit variances, then find multiple correlation coefficient of X_1 on $X_1 + X_2$ and $X_1 - X_2$.



5. Attempt **any two** of the following :

14

i) Define Geometric distribution with parameter p and obtain its mean, variance and distribution function.

ii) A discrete random variable X has the probability mass function (p.m.f.)

$$P(X = x) = \frac{K2^x}{x!}, x = 1, 2, \dots$$

Find (i) Constant K , (ii) $P(1 \leq X \leq 3)$ (iii) $P(X > 2)$.

iii) Define partial correlation coefficient. Derive an expression of partial correlation coefficient in terms of simple correlation coefficients.



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B.Sc. – II (Semester – III) (CGPA) Examination, 2017
MATHEMATICS (Paper – III)
Differential Calculus

Time : 2½ Hours

Max. Marks : 70

Instructions : 1) **All questions are compulsory.**
2) **Figures to the right indicate full marks.**

1. Choose and write correct answer from given **four** alternatives : **14**
- 1) The curvature of a straight line at every point thereof is
a) Zero b) One c) Two d) None of these
- 2) The intrinsic formula for the radius of curvature is
a) $\rho = \frac{dy}{dx}$ b) $\rho = \frac{ds}{d\psi}$
c) $\rho = \frac{1}{s} \frac{ds}{d\psi}$ d) $\rho = s \frac{d\psi}{ds}$
- 3) Radius of curvature of the curve $y = e^x$ at the point (0, 1) is
a) $2\sqrt{2}$ b) $3\sqrt{2}$ c) 0 d) None of these
- 4) The Pedal formula for the radius of curvature is
a) $\rho = r + \frac{dr}{dp}$ b) $\rho = r \frac{dp}{dr}$ c) $\rho = r \frac{dr}{dp}$ d) $\rho = \frac{1}{r} \frac{dr}{dp}$
- 5) The radius of curvature at the point (r, θ) on the curve $r = a$ is
a) a b) a^2 c) $a^{3/2}$ d) $\frac{a(1+\theta^2)^{3/2}}{\theta}$
- 6) The necessary condition for a function $f(x)$ to have a maxima at $x = c$ is that :
a) $f'(c) > 0$ b) $f'(c) = 0$ c) $f'(c) < 0$ d) None of these



- 7) $f(c)$ is an extreme value of f if and only if $f'(x)$
- Changes sign as x passes through c
 - Does not change sign
 - Remains constant
 - Exists only
- 8) The maximum value of $\sin x + \cos x$ is
- 2
 - $\sqrt{2}$
 - 1
 - 2^2
- 9) The minimum value of the function $f(x) = \frac{(x+1)(x+4)}{(x-1)(x-4)}$ is
- 1
 - 1
 - 9
 - $-\frac{1}{9}$
- 10) Function $u = \sin x \sin y \sin(x+y)$ at $x = y = \frac{\pi}{3}$ is
- Maximum
 - Minimum
 - Neither maximum nor minimum
 - None of these
- 11) If each u, v, w is a function of the variables x, y, z then the Jacobian $\frac{\partial(u, v, w)}{\partial(x, y, z)}$ is determinant of order
- 9
 - 3
 - 1
 - n
- 12) If $x = r \cos \theta, y = r \sin \theta$, then $\frac{\partial(r, \theta)}{\partial(x, y)} \times \frac{\partial(x, y)}{\partial(r, \theta)}$ is equal to
- 0
 - 1
 - 2
 - ∞
- 13) If $u = x(1+y), v = y(1+x)$, then $\frac{\partial(u, v)}{\partial(x, y)} =$
- $1+xy$
 - $1-xy$
 - $1+x+y$
 - $1-x+y$
- 14) If $u = e^x \cos y, v = e^x \sin y$, then $\frac{\partial(u, v)}{\partial(x, y)} =$
- e^x
 - e^{2x}
 - e^{-x}
 - $\sin x$



2. Attempt **any seven** of the following : 14
- 1) Define the term curvature of a curve.
 - 2) Find the radius of curvature of $s = c \operatorname{logsec} \psi$ at any point.
 - 3) Find $\frac{ds}{dx}$ for the curve $y = \cosh \left(\frac{x}{c} \right)$.
 - 4) If $u = x^2$, $v = y^2$ then find $\frac{\partial(u, v)}{\partial(x, y)}$.
 - 5) If $u = 3x + 2y - z$, $v = x - 2y + z$, $w = x + 2y - z$, find $\frac{\partial(u, v, w)}{\partial(x, y, z)}$.
 - 6) If $x = uv$, $y = \frac{u}{v}$, find $\frac{\partial(x, y)}{\partial(u, v)}$.
 - 7) Define the term minimum value of a function.
 - 8) Find the greatest and least values of the function $x^4 - 4x^3 - 2x^2 + 12x + 1$ in the interval $[-2, 5]$.
 - 9) State the condition for stationary value of a function of two variable.
3. A) Attempt **any two** of the following : 10
- 1) Find the points on the surface $z^2 = xy + 1$ which are at the least distance from the origin.
 - 2) If x and y are roots of a quadratic equation in p given by $(p - u)^2 + (p - v)^2 = 0$, then prove that $\frac{\partial(x, y)}{\partial(u, v)} = \frac{u - v}{x - y}$.
 - 3) Show that the curvature of the point $\left(\frac{3a}{2}, \frac{3a}{2} \right)$ on the folium $x^3 + y^3 = 3axy$ is $-8\sqrt{2} / 3a$.
- B) Find the expression for the radius of curvature for $y = f(x)$. 4



4. Attempt **any two** of the following :

14

- 1) Show that the radius of curvature for the cycloid $x = a(\theta + \sin \theta)$, $y = a(1 - \cos \theta)$ is $4a \cos(\theta/2)$.
- 2) If u, v, w are implicit functions of x, y, z i.e. $f_i(u, v, w, x, y, z) = 0, i = 1, 2, 3$.

$$\text{Then prove that } \frac{\partial(u, v, w)}{\partial(x, y, z)} = (-1)^3 \frac{\frac{\partial(f_1, f_2, f_3)}{\partial(x, y, z)}}{\frac{\partial(f_1, f_2, f_3)}{\partial(u, v, w)}}.$$

- 3) Discuss the maximum and minimum value of u given by $u = x^3y^2(1 - x - y)$.

5. Attempt **any two** of the following :

14

- 1) Explain the Lagrange's method of undetermined multipliers for two variables subject to single condition.
- 2) If $u = \frac{x+y}{z}, v = \frac{y+z}{x}, w = \frac{y(x+y+z)}{xz}$, show that u, v, w are not independent and find the relation between them.
- 3) Derive the expression for the radius of the curvature for the curve given by $r = f(\theta)$.



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B.Sc. – II (Semester – III) (CGPA) Examination, 2017
MATHEMATICS (Paper – IV)
Real Analysis

Time : $2\frac{1}{2}$ Hours

Max. Marks : 70

N.B. : 1) **All questions are compulsory.**
2) **Figures to the right indicate full marks.**

1. Choose the correct alternative for **each** of the following : **14**
- 1) Every non-empty subset of natural numbers has a first element is called _____
- a) The well-ordering principle b) The property of order-completeness
c) The Archimedean property d) The Dedekinds property
- 2) The infimum of the set $\{ \frac{1}{n} : n \in \mathbb{N} \}$ is _____
- a) 0 b) 1 c) $\frac{1}{2}$ d) None of these
- 3) Every non-empty set of real numbers which is bounded below has _____
- a) The supremum in \mathbb{R}
b) The infimum in \mathbb{R}
c) Neither infimum nor supremum in \mathbb{R}
d) The greatest member in \mathbb{R}
- 4) If a and b are any two positive real numbers then there exists a positive integer n such that _____
- a) $na \leq b$ b) $na < b$ c) $na > b$ d) $a > nb$
- 5) If $a \leq b + \frac{1}{n}$, for all $n \in \mathbb{N}$ and $a, b \in \mathbb{R}$ then _____
- a) $a = b$ b) $a > b$ c) $a \geq b$ d) $a \leq b$



6) The sequence $\left\{ \frac{n}{n+1} \right\}_1^\infty$ is _____

- a) Bounded below only b) Bounded above only
c) Bounded d) Unbounded

7) The limit point/s of the range set of the sequence $\left\{ 1 + \frac{(-1)^n}{n} \right\}_1^\infty$ is/are _____

- a) 1 b) 1 and -1 c) 0 and 2 d) -2

8) If $a_n = \sin\left(\frac{n\pi}{3}\right)$, $n \in \mathbb{N}$, then $\lim_{n \rightarrow \infty} a_n = 0$ _____

- a) -1 b) 1 c) $\frac{\sqrt{3}}{2}$ d) $-\frac{\sqrt{3}}{2}$

9) $\lim_{n \rightarrow \infty} \frac{1+2+3+\dots+n}{n^2} =$ _____

- a) $\frac{1}{2}$ b) 1 c) 0 d) Does not exist

10) If $\lim_{n \rightarrow \infty} S_n = l$, $\lim_{n \rightarrow \infty} t_n = m$, then $\lim_{n \rightarrow \infty} \frac{S_1 t_n + S_2 t_{n-1} + \dots + S_n t_1}{n} = lm$ is

called _____

- a) Sandwich theorem
b) Cesaro's theorem
c) Cauchy theorem
d) Bolzano-Weirstrass theorem

11) The series $\sum a_n$ of +ve terms is convergent if $\lim_{n \rightarrow \infty} n \left(\frac{a_n}{a_{n+1}} - 1 \right) = L$ then

- a) $L = 1$ b) $L < 1$ c) $L \leq 1$ d) $L > 1$



12) $\lim_{n \rightarrow \infty} \left(1 + \frac{1}{\sqrt{n}}\right)^{-3n^{1/2}} = \underline{\hspace{2cm}}$

- a) e b) $\frac{1}{e}$ c) $e^{3/2}$ d) $\frac{1}{e^3}$

13) The series $\sum_{n=1}^{\infty} (-1)^n$ is $\underline{\hspace{2cm}}$

- a) Convergent b) Divergent c) Oscillatory d) None of these

14) If the series $\sum_{n=1}^{\infty} a_n$ converges, then $\lim_{n \rightarrow \infty} a_n = 0$ is $\underline{\hspace{2cm}}$

- a) a necessary condition but not sufficient
b) a sufficient condition but not necessary
c) both necessary and sufficient condition
d) none of these

2. Attempt **any seven** of the following :

14

- 1) Find the g.l.b. and l.u.b. of the set $S = \{x \in \mathbb{Z} / x^2 \leq 16\}$.
- 2) Define the term order structure.
- 3) If $S \subseteq T \subseteq \mathbb{R}$, where $S \neq \phi$, then show that if T is bounded above, then $\text{Sup } S \leq \text{Sup } T$.
- 4) Write down the formula for the sequence 1, -3, 5, -7, 9, -11, 13, -15,
- 5) Show that $\lim_{n \rightarrow \infty} \frac{2n - 3}{n + 1} = 2$.
- 6) Show that for any real number x, $\lim_{n \rightarrow \infty} \frac{x^n}{n!} = 0$.
- 7) Show that the series $\sqrt{\frac{1}{2}} + \sqrt{\frac{2}{3}} + \dots + \sqrt{\frac{n}{n+1}} + \dots$ does not converge.
- 8) State the Raabe's Test.
- 9) Test for convergence the series $\sum_{n=1}^{\infty} \frac{1}{n^2}$.



3. A) Attempt **any two** of the following : 10
- 1) Show that Supremum and infimum for a set, if exists are unique.
 - 2) Show that every convergent sequence is bounded.
 - 3) State and prove Pringsheim's theorem.

B) Show that the series $\sum_1^{\infty} \frac{1}{n}$ is divergent. 4

4. Attempt **any two** of the following : 14
- 1) Prove that the Dedekinds property is equivalent to completeness property in \mathbb{R} .

2) Show that the sequence $\{S_n\}$, where $S_n = \left(1 + \frac{1}{n}\right)^n$, is convergent and that

$$\lim_{n \rightarrow \infty} \left(1 + \frac{1}{n}\right)^n \text{ lies between 2 and 3.}$$

3) State and prove D'Alemberts Ratio Test.

5. Attempt **any two** of the following : 14

- 1) If $f : A \rightarrow B$ and if $X \subset A$ and $Y \subset A$ then prove that $f(X \cap Y) \subset f(X) \cap f(Y)$. Is converse true ? Justify your answer.
- 2) State and prove Cantor's Intersection theorem for real line.

3) Discuss the convergence of $\sum_{n=1}^{\infty} \frac{1.3.5 \dots (2n-1)}{2.4.6 \dots (2n)} \cdot \frac{x^{2n}}{2n}$.



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B.Sc. – II (Semester – III) (CGPA Pattern) Examination, 2017
ELECTRONICS
Electronics Circuits (Paper – III)

Time : 2½ Hours

Max. Marks : 70

- Instructions:** 1) **All questions are compulsory.**
2) Figures to the **right** indicate **full** marks.
3) Draw **neat** labelled diagrams **wherever** necessary.
4) **Use** of log-table and calculator is **allowed**.

1. Select correct alternative for the following : **14**
- i) The efficiency of full wave rectifier is _____ %.
a) 40.3 b) 81 c) 121 d) 50
- ii) DC level and low level frequency signal is amplified by _____ amplifier.
a) RC coupled b) DC coupled
c) Transformer coupled d) LC coupled
- iii) Colpitt's oscillator uses _____ tank circuit.
a) Inductor tapped b) Capacitor tapped
c) RC tapped d) LC tapped
- iv) Gain of feedback amplifier is given by $A_{vf} =$
a) $A_v/1 - K A_v$ b) $A_v(1 + K A_v)$ c) $A_v(1 - K A_v)$ d) $K A_v$
- v) In multi stage amplifier voltage gain
a) Increases b) Decreases c) Not affected d) Becomes zero
- vi) _____ bias is the best method of transistor biasing.
a) Emitter b) Collector to base
c) Fixed d) Voltage divider
- vii) Emitter follower amplifier is also called as _____ amplifier.
a) Common emitter b) Common base
c) Common collector d) Common source



- viii) Feedback factor k is always
- a) Equal to one
 - b) Greater than one
 - c) Less than one
 - d) Zero
- ix) Cross over distortion is eliminated in _____ push pull amplifier.
- a) Class-A
 - b) Class-B
 - c) Class-AB
 - d) Class-C
- x) In phase shift oscillator phase angle across each network is _____ degree.
- a) 60
 - b) 120
 - c) 180
 - d) 360
- xi) Conversion of AC into DC is called
- a) Regulator
 - b) Filter
 - c) Amplifier
 - d) Rectifier
- xii) Stability factor of fixed base bias common emitter amplifier is
- a) β^2
 - b) 1
 - c) $1 + \beta$
 - d) 2β
- xiii) Current gain of Darlington pair amplifier is
- a) $\beta_1 + \beta_2$
 - b) β_2/β_1
 - c) $\beta_1 \cdot \beta_2$
 - d) $\beta_2 - \beta_1$
- xiv) In Wein-bridge oscillator expression for frequency of oscillation is $f =$
- a) $\frac{1}{2\pi RC\sqrt{6}}$
 - b) $\frac{1}{2\pi RC\sqrt{10}}$
 - c) $\frac{1}{2\pi RC}$
 - d) $\frac{1}{2\pi\sqrt{RC}}$

2. Answer **any seven (two marks each)** :

14

- i) What is rectification ? What are its types ?
- ii) Define operating point and stability factor.
- iii) What is need of cascading of amplifier stages ?
- iv) What is power amplifier ? Give its classification.
- v) What is Barkhausen criterion for sustained oscillations in the tank circuit ?
- vi) Draw the circuit diagram of complimentary-symmetry amplifier.
- vii) In an amplifier with negative feedback $A_v = 20$ and $\beta = 0.2$. Calculate gain with feedback.
- viii) Draw the circuit diagram of Colpitt's oscillator.
- ix) Enlist the methods of transistor biasing.



3. A) Answer **any two (five marks each)** : **10**
- i) Explain half wave rectifier circuit.
 - ii) Explain fixed base-bias method of biasing BJT.
 - iii) Explain Darlington pair amplifier.
- B) Design Wein-bridge oscillator to get frequency of 725 Hz with $C = 0.1 \mu\text{F}$. **4**
4. Answer **any two (seven marks each)** : **14**
- i) Explain full wave center tapped rectifier with derivation of ripple factor and efficiency.
 - ii) Explain voltage divide biasing with derivation of stability factor.
 - iii) What is feedback in amplifier ? What are its types ? Explain how negative feedback decreases gain.
5. Answer **any two (seven marks each)** : **14**
- i) Explain Hartley oscillator with neat circuit diagram.
 - ii) Discuss AC analysis of common emitter configuration amplifier.
 - iii) Explain Piezo electric crystal with its equivalent circuit. Explain Pierce crystal oscillator.
-



- 7) The nutrients serve as a store of _____ energy in the form of Carbohydrates proteins of fats.
A) Chemical B) Physical C) Solar D) Lunar
- 8) The _____ are classified as herbivores, carnivores and omnivores.
A) Decomposer B) Produces C) Autotrophs D) Consumers
- 9) The _____ ecosystems are specially studied due to change in salinity.
A) Marine B) Tidal C) Tundra D) Terrestrial
- 10) The animals are called as _____ they are unable to produce their own food.
A) Herbivorous B) Carnivorous
C) Heterotrophs D) Autotrophs
- 11) The _____ ecosystem is considered as richest in biodiversity.
A) Desert B) Taiga C) Tundra D) Tropical Forest
- 12) _____ is one of the methods of conservation of biodiversity.
A) Genetic bank B) Reserve Bank
C) Central Bank D) Blood Bank
- 13) There are two _____ spots of biodiversity in India.
A) Cool B) Cold C) Warm D) Hot
- 14) The term _____ is used to describe the number, variety and variability of living organization.
A) Biodiversity B) Plantdiversity
C) Animaldiversity D) Racialdiversity

2. Answer **any five** of the following :

15

- 1) Define biogeography.
- 2) What is environment ?
- 3) Name physical factors of biogeography.
- 4) State the law of energy exchange.
- 5) What is biomass ?
- 6) What is biodiversity ?



3. Answer **any three** of the following : 15
- 1) Describe the branches of biogeography.
 - 2) Explain the importance of Physiography in biogeography.
 - 3) Describe the characteristics of grass land ecosystem.
 - 4) Explain the hot spot of biodiversity.
4. Write **any three** of the following : 15
- 1) Explain the nature of biogeography.
 - 2) State the influence of anthropogenic factor on biogeography.
 - 3) Explain the carbon cycle.
 - 4) Describe the types of biodiversity.
5. A) Answer **any one** of the following long answer question. 6
- 1) Explain the food chain and food web.
 - 2) Describe the types of ecosystem.
- B) Answer **any one** of the following long answer question. 5
- 1) Explain the importance of climate in biogeography.
 - 2) What is conservation of biodiversity ?
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B.Sc. – II (Semester – III) (CGPA) Examination, 2017
ELECTRONICS
Pulse and Switching Circuits (Paper – IV)

Time : 2½ Hours

Max. Marks : 70

- N.B. :** 1) **All questions are compulsory.**
2) Draw the **neat** diagram **wherever** necessary.
3) Figures to the **right** indicate **full** marks.
4) **Use of log tables or calculators are allowed.**

1. Select the correct alternative for the following. **14**

i) _____ circuit produces narrow positive and negative pulses from a rectangular wave input.

- a) Integrator b) Differentiator c) Clipper d) Clamper

ii) The criteria for a good differentiating circuit is that its time constant ($T = R.C$) should be

- a) much larger than the period of the input waveform
b) less than or equal to the period of the input waveform
c) much smaller than the period of the input waveform
d) none of these

iii) The clamper circuit is used to

- a) introduce a dc level to ac signal
b) suppress variations in amplitude of the input signal
c) obtain an output which is integral of the input signal
d) none of these

iv) The sweep speed of simple RC circuit is given by

- a) I/C b) I_r/C c) $\frac{T_s}{RC}$ d) $\frac{V.T_s}{RC}$

P.T.O.



- v) If UJT oscillator circuit is provided by a constant voltage source then _____ type of wave forms are generated.
a) triangular b) square c) positive ramp d) sawtooth
- vi) A monostable multivibrator has
a) one stable state and one quasistable state
b) two stable states
c) two quasistable states
d) three states
- vii) In a Schmitt trigger circuit the UTP is +2.5V and LTP is +1.0V then hysteresis voltage will be
a) 3.5 V b) 2.5 c) 1.0V d) 1.5V
- viii) An astable multivibrator is widely used as the generator of
a) sine wave b) square wave
c) triangular wave d) all of these
- ix) If $T_{ON} = 1$ m sec and $T_{OFF} = 4$ m sec, then the duty cycle of astable multivibrator is
a) 20% b) 25% c) 33.33% d) None of these
- x) If a bistable multivibrator is triggered at 500Hz input signal frequency, then output frequency will be
a) 500 Hz b) 250 Hz c) 1KHz d) 2KHz
- xi) If the sweep time of general sweep voltage is gusec and the fly back time is 1 usec, then the sweep frequency is approximately
a) 1 MHz b) 1.5 MHz c) 100 KHz d) 10 KHz
- xii) Application of IC 555 are
a) astable multivibrator b) monostable multivibrator
c) battery charger d) all of above
- xiii) In application of IC 555 as voltage controlled oscillator, the frequency sweeping voltage is applied to pin number
a) 5 b) 4 c) 2 d) 6
- xiv) The average output voltage of negative clipper circuit will always be
a) Positive b) Negative c) Zero d) Infinity



2. Answer **any seven** of the following. **14**
- i) Explain the need of wave shaping circuits.
 - ii) Differentiate between linear and nonlinear wave shaping circuits.
 - iii) Draw labelled pin diagram of IC 555.
 - iv) Give the applications of multivibrator.
 - v) Draw the circuit of negative clipper.
 - vi) Write the equations for frequency and percent duty cycle of an astable multivibrator using IC 555.
 - vii) Explain in brief working of transistor as switch.
 - viii) Determine the gate width of monostable multivibrator using IC 555, where $R = 10K\Omega$ and $C = 0.01 \mu F$.
 - ix) Draw labelled pin diagram of IC 74121.
3. A) Attempt **any two** of the following. **10**
- i) Explain RC integrator circuit.
 - ii) Explain Miller integrator circuit.
 - iii) Explain astable multivibrator using NAND gates.
- B) Explain application of IC 555 timer as voltage controlled oscillator. **4**
4. Attempt **any two** of the following. **14**
- i) With neat circuit diagram explain the working of UJT relaxation oscillator.
 - ii) Explain astable multivibrator using BJT. Calculate output frequency when timing resistor is $10K\Omega$ and capacitor at $0.1 \mu F$ are connected.
 - iii) Draw the functional block diagram of IC 555 timer and explain in brief.
5. Attempt **any two** of the following. **14**
- i) Explain monostable multivibrator using BJT obtain an expression for gate width.
 - ii) Explain monostable multivibrator using IC 555 write an expression for gate width.
 - iii) With neat circuit diagram explain the operation of Schmitt trigger. Give its applications.
-



3. A) Attempt **any two** of the followings : **10**
- 1) Write an object oriented program that prints all perfect numbers between 1 to 100.
 - 2) Explain ‘Function overloading’ in detail.
 - 3) Write a program that demonstrates overloading of constructor.
- B) How will you store multiple records in single object ? Explain it with suitable example. **4**
4. Answer **any two** of the followings : **14**
- 1) Write a program to overload + as binary operator that concatenates two strings together.
 - 2) What is constructor ? Explain all types of constructor’s in detail.
 - 3) Write a program to implement Hierarchical inheritance.
5. Answer **any two** of the followings : **14**
- 1) What is type conversion ? Explain implicit and explicit type conversion with one example.
 - 2) Write a program that demonstrate the use of ‘this’ keyword.
 - 3) Write an object oriented menu driven program that performs following bank transactions.
 - 1) Create account
 - 2) Deposit amount
 - 3) Withdraw amount
 - 4) Account summary.
-



Seat No.	
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**B.Sc. – II (Semester – III) (CGPA) Examination, 2017
COMPUTER SCIENCE
RDBMS (Paper – IV)**

Time : 2.30 Hours

Total Marks : 70

Instructions : 1) **All** questions are **compulsory**.
2) **All** questions carry **equal** marks.

1. Choose **correct** alternative :

14

1) Which person is responsible for overall activities for database ?

- a) Database Designer
- b) Database Analyst
- c) Database Administrator
- d) Database Manager

2) The function of a database is _____

- a) To check all input data
- b) To check all spelling
- c) To collect and organize data
- d) All of the above

3) DML language is used to _____

- a) Define schema
- b) Define internal level
- c) Modify schema
- d) Access of data

4) _____ is the attribute that uniquely identify occurrence of each entity.

- a) Foreign key
- b) Primary key
- c) Relation key
- d) All of the above

5) _____ are unsophisticated users.

- a) Naive users
- b) Application programmers
- c) DBA
- d) Specializes users



- 6) _____ is responsible for fetching data from disk storage into main memory.
- a) Integrity Manager b) Transaction Manager
c) File Manager d) Buffer Manager
- 7) Select 'database' from dual where 1 = NULL ; result is _____
- a) Database b) False
c) True d) No row selected
- 8) _____ character represents zero or more characters while matching the pattern.
- a) * b) – c) + d) %
- 9) What is the degree of a table with 25 rows and 7 columns ?
- a) 175 b) 25
c) 7 d) None of the above
- 10) Raw is used to store ASCII data
- a) True b) False
- 11) A table with columns and rows is called as a
- a) Table b) Relation
c) Key d) None of the above
- 12) To substitute any NULL value with a user specified value, we use
- a) TO CHAR function b) NVL function
c) DATE function d) None of the above
- 13) Oracle provides a special table that can be used to test any function. This table is
- a) DUAL table b) EMPLOYEE table
c) SALARY table d) None of the above
- 14) PL/SQL is a
- a) Non-procedural DML b) Procedural DML
c) Formal Query Language d) None of the above



2. Solve **any seven** of the following : **14**
- 1) List the clause in SQL.
 - 2) Data types in PL/SQL.
 - 3) Character functions in SQL.
 - 4) Explain Case Expression in SQL.
 - 5) Write simple PL/SQL block.
 - 6) Define Trigger. List it's type.
 - 7) List types of parameters in PL/SQL.
 - 8) List cursor attributes in PL/SQL.
 - 9) Define Attribute, Tuple.
3. A) Attempt **any two** of the following : **10**
- 1) List and explain aggregate functions used in SQL.
 - 2) What is meant by Exception ? Explain it's type in PL/SQL.
 - 3) What are the advantages and disadvantages of DBMS.
- B) Create table student. Use 4 attributes and 2 constraints. **4**
4. Attempt **any two** of the following : **14**
- 1) Write note on components of a DBMS.
 - 2) What is sub query ? Explain it's type with example.
 - 3) What is package in PL/SQL ? Create procedure inside package.
5. Attempt **any two** of the following : **14**
- 1) Create a function to check given number is palindrome or not.
 - 2) Write a trigger on emp table which shows the old and new value of ename after any updation on ename of emp table.
 - 3) Explain explicit cursor with suitable example.
-



2. Answer **any seven** of the following : **14**
- i) Differentiate between myoglobin and haemoglobin.
 - ii) Why sucrose is a non reducing sugar ?
 - iii) Draw the structures of thiamine and riboflavin.
 - iv) Define coenzyme and holoenzyme.
 - v) Write two differences between amylose and cellulose.
 - vi) Name three subclasses of fibrous proteins.
 - vii) Draw structures of palmitic acid and lauric acid.
 - viii) What are deficiency disorders of pyridoxine ?
 - ix) Write names of various prosthetic groups involved in the formation of compound lipids.
3. A) Answer **any two** of the following : **10**
- i) What are the salient features of induced fit hypothesis ?
 - ii) Write down ninhydrin reaction for amino acids.
 - iii) Classify derived lipids with example.
- B) Explain Secondary structure of protein. **4**
4. Answer **any two** of the following : **14**
- i) Explain in detail with sub classification of complex proteins.
 - ii) Explain monosaccharide and classify types of monosaccharide with example.
 - iii) What are oligosaccharides ? Write structures of maltose, cellulose, lactose, sucrose and isomaltose.
5. Answer **any two** of the following : **14**
- i) Explain the structure of pantothenic acid as structure, source, biochemical role and deficiency disorder.
 - ii) What is induced fit hypothesis ? Explain 3 factors affecting enzyme activity.
 - iii) What are enzymes ? Write note on Line weaver Burk spot.
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Seat No.	
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B.Sc. – II (Semester – III) (CGPA Pattern) Examination, 2017
PLANT PROTECTION
Paper – I : Major Crops and Methods of Integrated Plant Protection

Time : 2½ Hours

Max. Marks : 70

- Instructions:** I) **All questions are compulsory.**
II) **All questions carry equal marks.**
III) **Draw neat and labelled diagrams wherever necessary.**
IV) **Figures to the right indicate full marks.**

1. Choose and write the correct answer from the given alternative : **(1×14=14)**
- 1) _____ are concerned with the methods of integrated plant protection.
 - a) Cereals
 - b) Vegetables
 - c) Pulses
 - d) All the above
 - 2) Jowar belongs to the class
 - a) Dicotylidonae
 - b) Monocotylidonae
 - c) Tricotylidonae
 - d) None of these
 - 3) Sunflower is the example of _____ crop.
 - a) Oil seed
 - b) Cereals
 - c) Fruit
 - d) Floriculture
 - 4) Crop hygiene is the example of _____ methods.
 - a) Mechanical
 - b) Physical
 - c) Biological
 - d) Cultural
 - 5) Shaking of plants is the examples of _____ methods.
 - a) Mechanical
 - b) Physical
 - c) Cultural
 - d) Chemical
 - 6) Wheat has the origin from _____ region of India.
 - a) North-South
 - b) North-East
 - c) North
 - d) North-West
 - 7) Groundnut is native of South
 - a) Africa
 - b) India
 - c) America
 - d) Europe



- 8) Sugarcane requires _____ temperature for its growth.
a) 20 – 27°C b) 20 – 26°C c) 20 – 28°C d) 20 – 29°C
- 9) *Cajanus cajan* belongs to the family
a) Papilionaceae b) Myrtaceae
c) Liliaceae d) Palmae
- 10) Pests of *Cicer arietinum* are controlled with the help of
a) BHC – 10% b) BSC – 10% c) BMC – 10% d) DHC – 10%
- 11) Brinjal belongs to the family
a) Meliaceae b) Solanaceae
c) Poaceae d) Zygomycetaceae
- 12) _____ are used for preventing the movement of the crawling insect.
a) Micky bands b) Sticky bands
c) Sticky bands d) All of these
- 13) _____ control of insect pest is based on the exploitation of mutual antagonism.
a) Chemical b) Mechanical
c) Biological d) Cultural
- 14) Coffee rust came to India from
a) Japan b) China c) Thailand d) Sri Lanka

2. Attempt **any seven** of the following :

(7×2=14)

- i) Write the scientific name and family of Gerbera.
- ii) Give the morphology of rose.
- iii) Describe the fertilizers required for cabbage.
- iv) Explain the economic importance of mango.
- v) Define organic farming.
- vi) What is crop rotation ?
- vii) Define tillage.
- viii) What are physical methods of plant protection ?
- ix) Define rope dragging.



3. A) Attempt **any two** of the following : **(2×5=10)**
- i) Give the role of organic farming in agriculture.
 - ii) Explain the soil type and fertilizers requirements for the wheat.
 - iii) Describe the netting and bagging studied by you.
- B) Give the general account of resistant varieties. **4**
4. Attempt **any two** of the following : **(2×7=14)**
- i) Explain the domestic quarantine studied by you.
 - ii) Describe the acaricides and molluscicides in disease management.
 - iii) Give the cultural practice of cotton with respect to soil types, fertilizers and disease management.
5. Attempt **any two** of the following : **(2×7=14)**
- i) Give the physical methods of heat and soil solarization for pest control.
 - ii) Explain the types of biofertilizers and their applications.
 - iii) Write the cultural practice of wheat with respect to soil types, fertilizers and disease management.
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Seat No.	
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B.Sc. (Part – II) (Semester – III) (CGPA) Examination, 2017
BIOCHEMISTRY (Paper – II)
Biochemical Techniques

Time : 2.30 Hours

Total Marks : 70

- Instructions :**
- 1) **All questions are compulsory.**
 - 2) Write chemical reactions **where** involved.
 - 3) Figures to the **right** indicate **maximum** marks.
 - 4) Draw **labelled** diagrams **wherever** necessary.

1. Write following sentences by selecting most **correct** answer from the following : **14**

- i) Indian patent act came into force in the year _____
a) 1950 b) 1960 c) 1970 d) 1980
- ii) In SDS-PAGE electrophoresis separation depends on _____ of the protein molecule.
a) Charge b) Concentration c) Size d) pH
- iii) TLC is the type of _____ chromatography.
a) Partition b) Adsorption c) Gas d) Column
- iv) Western blotting technique is used for blot transfer of _____
a) DNA b) Protein c) Lipids d) Carbohydrates
- v) Glutaraldehyde is used to immobilise enzymes by _____
a) Adsorption b) Intermolecular cross linking
c) Covalent bonding d) Entrapment in agar gel
- vi) ELISA technique is used to detect presence of _____ in small amounts.
a) DNA b) RNA c) Antibodies d) Lipoproteins
- vii) According to Beer's law absorbance of coloured solution depends on its _____
a) Length of cuvette b) pH of solution
c) Nature of colour d) Concentration of colouring solution

P.T.O.



- v) What is the role of stacking gel in SDS-PAGE ?
- vi) What is the principle of column chromatography ?
- vii) What is the trade secret ?
- viii) Why the enzymes immobilised in column adsorption gradually lose their activity ?
- ix) Name the chemicals used for preparation of polyacrylamide gel.

3. A) Attempt **any two** of the following : **10**

- i) What is the effect of ionic strength, pH and buffer on electrophoretic mobility ?
- ii) What are the limitations of colorimetric measurement ?
- iii) Explain applications of enzyme immobilisation.

B) What is the function of detectors used in HPLC ? **4**

4. Attempt **any two** of the following : **14**

- i) What is patent ? Write the procedure, advantage and disadvantage of patent.
- ii) What is hybridoma ? Explain hybridoma technology.
- iii) Write the industrial applications of immobilised enzymes.

5. Attempt **any two** of the following : **14**

- i) Write the principle, preparation of plate, working and uses of TLC.
 - ii) What is electrophoresis ? Explain three factors affecting electrophoretic mobility.
 - iii) Explain colorimeter with suitable diagram. What are limitations of colorimeter ?
-



Seat No.	
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B.Sc. II (Semester – III) (CGPA) Examination, 2017
PLANT PROTECTION
Paper – II : Crop Diseases and their Management

Time : 2½ Hours

Total Marks : 70

- Instructions :** 1) *All questions are compulsory.*
2) *Draw neat and labeled diagrams wherever necessary.*
3) *Figures to the right indicate full marks.*
4) *All questions carry equal marks.*

1. Select the correct answer and rewrite the sentences. **(1×14=14)**
- 1) Structural abnormalities associated with host plant is called
 - a) disease resistance
 - b) disease tolerance
 - c) disease triangle
 - d) plant disease
 - 2) _____ are the necrotic symptoms.
 - a) Death of plant tissue
 - b) Decay of plant tissue
 - c) Excess of cell division
 - d) Both a and b
 - 3) Root knot disease is caused by _____ pathogen.
 - a) viral
 - b) bacterial
 - c) fungal
 - d) nematode
 - 4) _____ of microbes is carried out in aseptic conditions.
 - a) Inoculation
 - b) Isolation
 - c) Incubation
 - d) All the above
 - 5) Transmission of plant pathogen is carried out by _____ agencies.
 - a) water
 - b) air
 - c) insects
 - d) all the above
 - 6) Koch's postulates are very useful in
 - a) Environment
 - b) Host
 - c) Finding exact cause of disease
 - d) Disease dispersal



3. A) Answer **any two** of the followings. **(2×5=10)**
- i) Classify plant diseases based on modes of dispersal.
 - ii) Describe any two methods of isolation of pathogen.
 - iii) Give the symptoms and control measures of rust of soya bean.
- B) Explain the symptoms and disease cycle of powdery mildew of cucurbits. **4**
4. Answer **any two** of the followings. **(2×7=14)**
- i) Add a note on concept of plant disease.
 - ii) Describe any two methods of inoculation.
 - iii) Describe the mode of infection.
5. Answer **any two** of the followings. **(2×7=14)**
- i) Classify plant diseases based on pathogens.
 - ii) Give an account of quantitative methods of crop disease assessment.
 - iii) Give symptoms, pathogen and control measures of early blight of Tomato.
-



- vii) The atomic substitution is higher at higher
- | | |
|----------------|-------------|
| a) Temperature | b) Pressure |
| c) Density | d) Volume |
- viii) The polymorphous of CaCO_3 is
- | | |
|--------------------|---------------------|
| a) Calcite | b) α -quartz |
| c) β -quartz | d) Kyanite |
- ix) The ratio of Si : O in single chain silicate structure is
- | | |
|----------|----------|
| a) 1 : 2 | b) 1 : 3 |
| c) 2 : 3 | d) 3 : 1 |
- x) The basic unit of silicate structure is
- | | |
|--------------------------|--------------------------|
| a) $(\text{SiO}_4)^{-1}$ | b) $(\text{SiO}_4)^{-2}$ |
| c) $(\text{SiO}_4)^{-3}$ | d) $(\text{SiO}_4)^{-4}$ |
- xi) The radius ratio of Zinc blende is
- | | |
|--------|--------|
| a) 0.1 | b) 0.2 |
| c) 0.3 | d) 0.4 |
- xii) $\text{CaCO}_{3(s)} \rightleftharpoons \text{CaO}_{(s)} + \text{CO}_{2(g)}$ is a _____ component system.
- | | |
|----------|---------|
| a) One | b) Two |
| c) Three | d) Four |
- xiii) In diamond, there is _____ hybridization.
- | | |
|------------------|------------------|
| a) Sp | b) Sp^2 |
| c) Sp^3 | d) None of these |
- xiv) In Sulphur System, there are _____ triple points.
- | | |
|----------|---------|
| a) One | b) Two |
| c) Three | d) Four |

2. Answer **any seven** of the following :

14

- i) Define component of a system. Give one example.
- ii) Define lattice energy of a crystal.
- iii) Define radius ratio.
- iv) Draw a single chain structure of silicate.
- v) Define the states of matter.



- vi) Define ionic bond. Give one example.
- vii) Draw the structure of Calcium chloride.
- viii) Discuss phase rule with respect to decomposition of calcium carbonate.
- ix) Define transition temperature. Give one example.

3. A) Answer **any two** of the following : **10**

- i) State and explain Gibb's phase rule.
- ii) Give the general rules of three dimensional structure with the help of solid geometry.
- iii) Draw the structure of NaCl.

B) Write a short note on polymorphism. **4**

4. Answer **any two** of the following : **14**

- i) Discuss sulphur system.
- ii) Give the general rules of bond type.
- iii) Discuss the principle of crystal structure.

5. Answer **any two** of the following : **14**

- i) Discuss water system.
 - ii) Write a short note on radii of common ions in rock forming minerals.
 - iii) Discuss Isomorphism.
-



2. Solve **any seven** of the following : 14
- 1) Salient features of phylum Mollusca.
 - 2) Gizzard of cockroach.
 - 3) Functions of foot in mytilus.
 - 4) Mandibles of cockroach.
 - 5) Osphradium of *Pila*.
 - 6) Bipinnaria.
 - 7) Symptoms of dengue disease.
 - 8) Storage excretion.
 - 9) Mushroom gland in cockroach.
3. A) Attempt **any two** of the following : 10
- 1) Explain nervous system of cockroach.
 - 2) Excretory system of *Pila*.
 - 3) Explain foot in cephalopoda.
- B) Mouth parts of butterfly. 4
4. Attempt **any two** of the following : 14
- 1) Circulatory system of cockroach.
 - 2) Female reproductive system of *Pila*.
 - 3) Symptoms and control measures of malaria disease.
5. Attempt **any two** of the following : 14
- 1) Digestive system of cockroach.
 - 2) Affinities of hemichordata.
 - 3) Describe nervous system of *Pila*.
-



Seat No.	
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B.Sc. – II (Semester – III) (CGPA) Examination, 2017
GEOCHEMISTRY
Introduction to Solar System and Geosphere (Paper – II)

Time : 2.30 Hours

Total Marks : 70

- Instructions :** 1) **All** questions are **compulsory**.
2) Figures to the **right** indicate **full** marks.
3) Draw **neat** labelled diagrams **wherever** necessary.

1. Fill in the blanks with **correct** answer from given options : **14**
- 1) In the cosmic abundances, the elements show a rapid exponential decrease for elements of the _____ atomic numbers.
- a) Lower b) Higher
c) Medium d) No relation with atomic numbers
- 2) Which planets revolve in retrograde motion ?
- a) Neptune and Pluto b) Earth and Mars
c) Uranus and Venus d) Mercury and Jupiter
- 3) The composition of terrestrial water is _____
- a) Ca > Mg > Na b) Ca > Na > Mg
c) Mg > Na > Ca d) Na > Ca > Mg
- 4) In seawater composition _____
- a) Mg > Na > Ca b) Ca > Na > Mg
c) Ca > Mg > Na d) Na > Mg > Ca
- 5) The uppermost atmospheric layer is _____
- a) Troposphere b) Stratosphere
c) Mesosphere d) Thermosphere



2. Answer **any seven** of the followings : **14**
- i) What is the thickness of transition zone present in the upper mantle ?
 - ii) At what depth lower mantle occurs ?
 - iii) What is the average composition of mantle + crust ?
 - iv) What is the composition of Cohenite ?
 - v) Who coined the concept of geochemical classification of the elements ?
 - vi) Contribution of volcanoes in evolution of atmosphere.
 - vii) Names of variable constituents of the atmosphere.
 - viii) What are the compositions of Sial and Sima ?
 - ix) Define pollution.
3. A) Write short notes on **any two** of the following : **10**
- i) Describe variable constituents of the atmosphere.
 - ii) Structure of atmosphere.
 - iii) Salinity and chlorinity of oceanic water.
- B) What is composition of the crust ? **4**
4. Answer **any two** of the following : **14**
- i) Describe meteorites. What are their types ?
 - ii) The atmosphere in second stage of its evolution.
 - iii) How primary differentiation of metals takes place ?
5. Answer **any two** of the following : **14**
- i) Explain in brief, geochemical classification of the elements.
 - ii) Describe atmospheric additions and losses during geologic time.
 - iii) Describe in detail, composition of sea water.
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Seat No.	
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B.Sc. – II (Semester – III) (CGPA) Examination, 2017
ZOOLOGY
Paper – IV : Cell Science, Genetics, Biological Chemistry
and Economic Zoology

Time : 2.30 Hours

Total Marks : 70

- Instructions :** 1) **All** questions are **compulsory**.
2) Draw **neat** and labeled diagrams **wherever** necessary.
3) Figures to the **right** indicate **full** marks.
4) **All** questions carry **equal** marks.

1. Select the **correct** alternatives and rewrite the sentences.

14

- 1) The product of milk after drying is called as _____
 - a) Milk butter
 - b) Curd
 - c) Milk powder
 - d) Rabadi
- 2) Silk contains protein _____
 - a) Glucose
 - b) Lactose
 - c) Albumin
 - d) Fibroin
- 3) Ratio of supplementary factor
 - a) 9:7
 - b) 9:3:4
 - c) 9:6:1
 - d) 9:3:3:1
- 4) Rearing of birds for production of egg and meat is known as _____
 - a) Poultry Science
 - b) Dairy Science
 - c) Silk Science
 - d) Milk Science
- 5) Jamunapuri goat are commonly found in _____
 - a) Kashmir
 - b) Bengal
 - c) Uttar Pradesh
 - d) Kerala

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2. Answer **any seven** of the followings : **14**
- i) Anaphase.
 - ii) Importance of linkage.
 - iii) Nerve cell.
 - iv) Importance of crossing over.
 - v) Egg.
 - vi) Queen of honey bees.
 - vii) Food value of honey.
 - viii) Gold fish.
 - ix) Biological significance of Lipids.
3. A) Answer **any two** of the followings : **10**
- i) Describe the complete linkage with example.
 - ii) Significance of meiosis.
 - iii) Rearing of Silkworm.
- B) Give an account on Milk and Milk by-products. **4**
4. Answer **any two** of the followings : **14**
- i) Economic importance of dairy farming.
 - ii) Give an account on buffalo breeds.
 - iii) Give the structure and function of DNA.
5. Answer **any two** of the followings : **14**
- i) Describe fresh water fish farming and its importance.
 - ii) Give an account on poultry farming.
 - iii) Describe the complementary interaction.
-



3. A) Answer **any two** of the following : 10
- 1) Apical cell theory with suitable diagram.
 - 2) Structure and function of lenticels with suitable diagram.
 - 3) Distinguishing characters of Fabaceae with suitable diagram.
- B) Give an account of normal secondary growth in Dicot stem with suitable diagram. 4
4. Answer **any two** of the following : 14
- 1) Give an account of mechanical tissue system with suitable diagram.
 - 2) Discuss Tunica corpus theory with suitable diagram.
 - 3) What is vascular bundles ? Discuss different types of vascular bundles.
5. Answer **any two** of the following : 14
- 1) Explain complex tissue with suitable diagram.
 - 2) Discuss abnormal secondary growth in bignonia.
 - 3) Give an account of family asclepiadaceae with suitable example.
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Seat No.	
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B.Sc. – II (Semester – III) Examination, 2017
BOTANY (Paper – IV) (CGPA)
Plant Ecology

Time : 2½ Hours

Total Marks : 70

- N.B. :** 1) **All questions are compulsory.**
2) Draw **neat** and labeled diagrams **wherever** necessary.
3) Figures to the **right** indicate **full** marks.

1. Rewrite the following sentences by choosing correct answer from the given alternatives.

14

- 1) Assemblage of plants in a habitat is called
 - a) Biological community
 - b) Animal community
 - c) Plant community
 - d) All of these
- 2) _____ is the top consumer in grassland ecosystem.
 - a) Grasshopper
 - b) Rabbit
 - c) Cow
 - d) Lion
- 3) Gradual replacement of one type of community by other is called
 - a) Formation
 - b) Succession
 - c) Adaptation
 - d) Stabilisation
- 4) _____ are the light loving plants.
 - a) Sciophytes
 - b) Heliophytes
 - c) Chamaephytes
 - d) Obligate sciophytes
- 5) The pyramid of number for single tree ecosystem is _____ in nature.
 - a) Inverted
 - b) Upright
 - c) Quadrangular
 - d) Circular
- 6) The _____ are the terrestrial plants with underground perennating buds.
 - a) Geophytes
 - b) Hydrophytes
 - c) Helophytes
 - d) Chamaephytes



- 7) The atmosphere contain _____ oxygen.
a) 18% b) 21% c) 23% d) 25%
- 8) _____ is the character of xerophytes.
a) Air chambers b) Multiple layer epidermis
c) Single layer epidermis d) Root pockets
- 9) Peeling of ozone is due to
a) CO₂ b) NO₂ c) CFC d) O₂
- 10) Soil porosity refers to the space between the
a) Soil structure b) Soil permeability
c) Soil particles d) Soil density
- 11) _____ is the stage of xerosere.
a) Amphibian b) Submerged c) Floating d) Crustose lichen
- 12) Secondary consumers are the
a) Herbivores b) Carnivores
c) Decomposers d) All of these
- 13) Presence of air chambers is the character of
a) Xerophytes b) Hydrophytes c) Mesophytes d) Geophytes
- 14) _____ is qualitative character of plant community.
a) Species diversity b) Density
c) Frequency d) Abundance

2. Answer **any seven** of the following :

14

- i) Enlist any four air pollutants.
- ii) Define ecosystem.
- iii) What is sciophytes ?
- iv) Define ecological pyramids.
- v) Xerosere.
- vi) What is humus ?
- vii) Floating hydrophytes.
- viii) Acid rain.
- ix) Define cryptophytes.



3. A) Attempt **any two** of the following : **10**
- i) Control measure of pollution.
 - ii) Comment upon the soil profile.
 - iii) Explain the pyramid of energy.
- B) Describe stratification. **4**
4. Attempt **any two** of the following : **14**
- i) What is hydrosere ? Explain the stages of hydrosere.
 - ii) What is biogeochemical cycles ? Add a note on Nitrogen cycle.
 - iii) Describe the impact of light and wind on plant life.
5. Attempt **any two** of the following : **14**
- i) What is pollution ? Describe the causes of water pollution.
 - ii) Discuss the qualitative characters of plant community.
 - iii) What is meant by adaptation ? Add a note on xerophytic adaptation.
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B.Sc. (Part – II) (Semester – III) (CGPA) Examination, 2017
PSYCHOLOGY
Experimental Psychology – (Paper – III)

Time : 2 ½ Hours

Max. Marks : 70

Instructions : 1) **All questions are compulsory.**
2) **Figures to the right indicate full marks.**

1. Choose and write a correct answer of the following four alternatives : **14**
- 1) Psychology is the science of
A) Behaviour B) Cognition C) Self D) Stress
 - 2) Experiments provide the experimenter with new data for describing and interpreting human
A) Behaviour B) Mind C) Society D) Soul
 - 3) _____ was an anatomist and physiologist.
A) Weber B) Maslow C) Skinner D) Adler
 - 4) In _____ psychology, there are four goals.
A) Experimental B) Sociology C) Economics D) Philosophy
 - 5) _____ being scientific in nature is highly factual.
A) Experimental Psychology B) Sociology
C) Economics D) Philosophy
 - 6) _____ law has come in for a lot of criticism.
A) Weber's B) Maslow's C) Skinner's D) Adler's
 - 7) _____ proceeded to restate the Weber's law by applying the methods of calculus.
A) Fechner B) Maslow's C) Skinner's D) Adler's



- 8) _____ developed the psychophysical procedures.
A) Fechner B) Maslow's C) Skinner's D) Adler's
- 9) _____ is usually the first step in understanding behaviour.
A) Description B) Control C) Prediction D) Explanation
- 10) Explanation is the second goal of _____ psychology.
A) experimental B) social C) cognitive D) abnormal
- 11) _____ is the third goal of experimental psychology.
A) Prediction B) Cognition C) Self D) Stress
- 12) The _____ tends to make a prediction of behaviour of winner and loser of fights in general.
A) Psychologist B) Physician C) Antagonists D) Sociologist
- 13) _____ psychology as practiced by Wundt.
A) Experimental B) Maslow C) Skinner D) Adler
- 14) _____ psychology is scientific in nature.
A) Experimental B) Physics C) Economics D) Marathi

2. Answer the following (**any seven**) :

14

- 1) Define Psychology.
- 2) Who was founder of Psychophysics ?
- 3) Who was developed first psychological laboratory ?
- 4) Who was a German physicist and physiologist ?
- 5) Who was the founder of the school of behaviorism ?
- 6) Who published "psychometric Investigation" ?
- 7) Define experimental psychology.
- 8) Who was founder of experimental psychology ?
- 9) Who made major contribution to the field of experimental psychology ?



3. A) Short notes (**any two**) : 10
- 1) Application in the clinical settings.
 - 2) Application in the field of education.
 - 3) Explanation and Controlling.
- B) Discuss on application in the research on motivation. 4
4. Answer the following (**any two**) : 14
- 1) Explain the application in organization.
 - 2) Discuss on the Fechner's law.
 - 3) Explain the Weber's law.
5. Answer the following (**any two**) : 14
- 1) Explain the method of constant stimuli.
 - 2) Explain the Average error.
 - 3) Explain the meaning and nature of sensation.
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B.Sc. – II (Semester – III) (CGPA) Examination, 2017
GEOLOGY (Paper – III)
Optics and Mineralogy

Time : 2½ Hours

Max. Marks : 70

- Instructions** : 1) **All questions are compulsory.**
2) **Figures to the right indicate full marks.**
3) **Draw neat labelled diagrams wherever necessary.**

1. Fill in the blanks with correct answer from given options : **14**
- 1) Which one of the following minerals is not a member of Garnet family ?
a) Pyrope b) Almandine
c) Andalusite d) Grossularite
 - 2) What is refractive index of Canada balsam ?
a) 1.537 b) 1.516 c) 1.658 d) 1.536
 - 3) Orthoclase and microcline are _____ of $KAlSi_3O_8$.
a) Pseudomorphs b) Isomorphs c) Polymorphs d) None of these
 - 4) The charge on SiO_4 tetrahedron is _____
a) – 6 b) – 5 c) – 4 d) – 3
 - 5) _____ of the minerals can be measured by keeping cleavages parallel to cross wires and then rotation of the stage till extinction.
a) Birefringence b) Twinning
c) Twinkling d) Extinction angle
 - 6) Red coloured cryptocrystalline variety of silica is _____
a) Jasper b) Chalcedony
c) Agate d) Opal



- iv) Difference between double and single refraction.
 - v) What is extinction ?
 - vi) What is the relationship between the vibration direction of ordinary ray and extra-ordinary ray ?
 - vii) Which mineral shows twinkling ?
 - viii) What are K-Felspars ?
 - ix) What is composition of Andalusite, Sillimanite and Kyanite ?
3. A) Write short notes on **any two** of the following : **10**
- i) What is isomorphism ? Describe it with examples.
 - ii) Why mica group of minerals show phyllosilicate structure ?
 - iii) Describe olivine group of minerals.
- B) Distinguish between pyroxenes and amphiboles. **4**
4. Answer **any two** of the following : **14**
- i) Describe plagioclase series with its members, percent compositions and occurrences.
 - ii) How feldspathoid minerals are formed ? Describe physical, chemical and optical properties of members of this group.
 - iii) How polarisation of light takes place in nicol's prism ?
5. Answer **any two** of the following : **14**
- i) Why the minerals show relief ? Give types and examples.
 - ii) Explain different types of twinnings.
 - iii) Describe sorosilicates and tectosilicates.
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B.Sc – II (Semester – III) (CGPA) Examination, 2017
MICROBIOLOGY (Paper – III)
Cytology and Physiology of Microorganisms

Time : 2½ Hours

Max. Marks : 70

- Instructions :** 1) **All** questions are **compulsory**.
2) Draw **neat** labelled diagrams **wherever** necessary.
3) Figures to the **right** indicate **full** marks.

1. Rewrite the sentences by choosing correct answer from the alternatives given below :

14

- 1) Volutin granules are
 - a) acidophilic
 - b) Neutral
 - c) Basophilic
 - d) Barophilic
- 2) Spore coat is rich in amino acids like
 - a) Cystein
 - b) Proline
 - c) Leucine
 - d) isoleucine
- 3) Peptidoglycan is absent in
 - a) Lactobacillus
 - b) Staphylococcus
 - c) Micrococcus
 - d) Halobacterium
- 4) _____ is the example of phage showing lysogeny.
 - a) T₄
 - b) λ
 - c) T₂
 - d) TMV
- 5) In Gram negative bacteria inner layer of cell wall is made up of
 - a) Protein
 - b) Phospholipid
 - c) Peptidoglycan
 - d) Lipopolysaccharide
- 6) _____ is an example of mesophilic organism.
 - a) E.Coli
 - b) B. Psychrophilus
 - c) Thermus aquaticus
 - d) B. Stearothermophilus



- 7) The Helmstetter and cummings technique is used obtain _____ culture.
a) Continuous b) Diauric c) Synchronous d) Batch
- 8) Organisms loving high salt concentration are called
a) Barophiles b) Halophiles c) Thermophiles d) Acidophiles
- 9) The effective bartericidal wavelength of U.V. light is
a) 2650 A° b) 2750 A° c) 2680 A° d) 2630 A°
- 10) Streptomycin acts on
a) Cell wall b) Capsule c) Ribosome d) Mesosome
- 11) Reverse transcriptase enzyme is present in _____ virus.
a) HIV b) TMV c) Hepatitis d) T₄ phage
- 12) Lock and key hypothesis was discovered by
a) Jacob and Monod b) Watson and Crick
c) Koshland d) Emile Fisher
- 13) Small solutes like H₂O, CO₂, O₂ enters in cell by way of
a) Passive diffusion b) Group translocation
c) Active transport d) Facilitated diffusion
- 14) Pili are chemically composed of
a) Protein b) Lipoprotein c) Nucleoprotein d) Lipids

2. Attempt **any seven** of the following :

14

- i) Define acidophiles.
- ii) Define generation time and growth rate.
- iii) Define ligases.
- iv) Group translocation.
- v) Define sex pili.



- vi) Structure of T₄ phage.
 - vii) Magnetosomes.
 - viii) Define chemotaxis.
 - ix) Carboxysomes.
3. A) Attempt **any two** of the following : **10**
- i) Cyclic photophosphorylation.
 - ii) Structure and function of endospore.
 - iii) PHB and Volutin granules.
- B) Effect of temperature on growth of microorganisms. **4**
4. Attempt **any two** of the following : **14**
- i) Synchronus growth.
 - ii) Oxidative phosphorylation.
 - iii) Effect of osmotic pressure on growth of microorganisms.
5. Attempt **any two** of the following : **14**
- i) Explain cell membrane of barterial cell.
 - ii) Describe continuous growth.
 - iii) Explain in detail tactic behaviour in bacteria.
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B.Sc. (Part – II) (Semester – III) (CGPA) Examination, 2017
PSYCHOLOGY
Social Psychology (Paper No. – IV)

Time : 2.30 Hours

Max. Marks : 70

Instructions : 1) **All questions are compulsory.**
2) **Figures to the right indicate full marks.**

1. Choose and write a correct answer of the following **four** alternatives. **14**
- 1) The term _____ was coined in 1798.
A) stereotypes B) cognitive C) abnormal D) experimental
 - 2) _____ opposed the concept of group minds.
A) Jung B) Miller C) Allport D) Skinner
 - 3) There are eight key areas in _____ psychology.
A) abnormal B) testing C) social D) cognitive
 - 4) _____ is the world's largest democracy.
A) India B) China C) Japan D) America
 - 5) Social psychologist proposed three models of _____ life.
A) urban B) city C) villages D) town
 - 6) Social psychology is the study of the individual's _____ in the context of society.
A) personality B) behaviour C) cognition D) emotion
 - 7) _____ as a mental and neural state of readiness, organizes through experience.
A) Learning B) Explanation C) Attitude D) Prediction
 - 8) William _____ published the first English book, "An Introduction to Social Psychology".
A) McDougall B) Bladwin C) Le Bon D) Adler
 - 9) Prejudice refers to a negative attitude towards _____.
A) anxiety B) people C) stress D) stereotypes
 - 10) _____ identity theory developed by Tajfels.
A) Emotional B) Educational C) Social D) Marital



- 11) _____ term was coined by Robert Butler.
 A) Ageism B) Sexism C) Racism D) Normal
- 12) _____ proposed the balance theory.
 A) Festinger B) Fritz C) Tajfels D) Maslow
- 13) The term stereotype was coined in _____
 A) 1998 B) 2009 C) 1798 D) 1891
- 14) Boqardus developed _____ distance scale.
 A) Social B) Educational C) Emotional D) Psychological

2. Answer the following (**any seven**) : **14**
- 1) Explain the concept of prejudice.
 - 2) Explain the cognitive measures.
 - 3) Explain the discrimination.
 - 4) Explain the physiological measurements.
 - 5) Explain the Re categorization.
 - 6) Explain the xenophobia.
 - 7) Explain the term of xenophobia.
 - 8) Explain the term of tokenism.
 - 9) Explain the balance theory.
3. A) Short notes (**any two**) : **10**
- 1) Cognitive distance
 - 2) Rating scales
 - 3) The behavioral components.
- B) Discuss on nature of prejudice. **4**
4. Answer the following (**any two**) : **14**
- 1) Explain the attitude formation.
 - 2) Explain the process of attitude change.
 - 3) Explain the relationship of social psychology and other social sciences.
5. Answer the following (**any two**) : **14**
- 1) Discuss on the cognitive component of prejudice.
 - 2) Describe the contributing of Stanley Milgram.
 - 3) Discuss on the factors influencing conformity.
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B.Sc. – II (Semester – III) (CGPA Pattern) Examination, 2017
GEOLOGY (Paper – IV)
Structural Geology

Time : 2½ Hours

Total Marks : 70

- Instructions :** 1) *All questions are compulsory.*
2) *Draw neat diagrams wherever necessary.*
3) *Figures to the right indicate full marks.*

1. Fill in the blanks with correct answers from the given options : **14**

- 1) The _____ are boundaries along which plates move away from each other.
a) convergent boundaries b) divergent boundaries
c) transform boundaries d) destructive boundaries
- 2) Major breaks in sedimentation are called _____.
a) confirmable b) unconformities
c) stratification d) none of these
- 3) The width of outcrop of a bed depend/s on _____.
a) the thickness of bed b) the angle of dip
c) topographic scale d) all of these
- 4) A _____ is an upright fold in which both the limbs are overturned.
a) fan fold b) recumbent fold
c) open fold d) close fold
- 5) An _____ is the area where the bed rock is exposed on the ground surface.
a) outcrop b) land scape
c) land form d) none of these
- 6) In _____ fold the hinge line is inclined.
a) horizontal b) non plunging
c) plunging d) all of these

P.T.O.



- 7) _____ substances undergo a large plastic deformation before rupture.
a) Ductile b) Soil c) Brittle d) None of these
- 8) The term _____ is used if beds are dipping in one direction.
a) homocline b) anticline
c) monocline d) structural terrace
- 9) _____ joints in folded rocks are perpendicular to the axis of folds.
a) release b) extension c) strain slip d) shear
- 10) Limbs in the isoclinal fold are _____ to each other.
a) parallel b) perpendicular
c) inclined d) tangential
- 11) Offset of streams are found along _____ fault.
a) normal b) reverse c) graben d) strike slip
- 12) A series of faults that have the same strike and dip are called the _____.
a) parallel fault b) gravity fault
c) oblique slip fault d) tension fault
- 13) Joints can be developed by _____.
a) Tectonic stresses b) Residual stresses
c) Surficial movement d) all of these
- 14) Sheet joint are often seen in the exposure of _____.
a) Basalt b) Sandstone c) Granite d) Shale

2. Solve **any seven** of the following :

14

- 1) Bedding plane.
- 2) Axial plane.
- 3) Difference between fault and joint.
- 4) What is Strike ?
- 5) What is fault plane ?
- 6) What is limb in fold ?
- 7) Define joint.
- 8) What is Footwall ?
- 9) What is crest and trough of fold ?



3. A) Attempt **any two** of the following : **10**
- 1) Explain open and close fold.
 - 2) Explain horst and graben fault.
 - 3) Explain columnar joints and feather joints.
- B) Explain outliers and inliers. **4**
4. Attempt **any two** of the following : **14**
- 1) Geometrical classification of joints.
 - 2) Explain concept of rock deformation.
 - 3) Explain recognition of fold in the field.
5. Attempt **any two** of the following : **14**
- 1) Explain width of outcrop.
 - 2) Explain terminology of fault.
 - 3) Explain types of unconformity.
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B.Sc. II (Semester – III) (CGPA) Examination, 2017
MICROBIOLOGY
Paper – IV : Bacterial Genetics

Time : 2.30 Hours

Max. Marks : 70

Instructions: 1) *All questions are compulsory.*
2) *Figures to right indicate full marks.*

1. Rewrite the sentences after choosing correct answer from the given alternatives. **14**

- 1) _____ are the repeating units of nucleic acids.
a) phosphate molecules b) nucleotides
c) bases d) sugar molecules
- 2) The enzyme which builds a mRNA strand complimentary to the DNA transcription unit is called
a) DNA polymerase b) RNA polymerase
c) Helicase d) DNA ligase
- 3) Nonsense codons are
a) Amber b) Ochre c) Opal d) All a, b and c
- 4) Process of genetic information flowing from DNA to RNA to proteins is called
a) gene annealing b) gene mutation
c) gene expression d) gene therapy
- 5) The term plasmid was coined by
a) Tatum b) Ochoa c) Lederberg d) Delbruck
- 6) Anti codon describes triplet bases on
a) mRNA b) rRNA c) tRNA d) DNA
- 7) Messenger RNA is synthesized during
a) translation b) transcription c) replication d) DNA synthesis



- 8) In prokaryotes initiation codons always codes for
a) N-Formyl methionine b) Cytocine
c) Glutamate d) Methionine
- 9) When mutation in codon may not produce any change in translation then it is called
a) point mutation b) silent mutation
c) missense mutation d) nonsens mutation
- 10) DNA replication by semiconservative mode in E.coli was experimentally proved by
a) Watson and Crick b) Neselson and Stahl
c) Zinder and Lederberg d) Delbruck and Delbruck
- 11) Messenger RNA is
a) single stranded b) double stranded
c) forms a sheet d) none of above
- 12) The enzyme required for synthesis of DNA from RNA template is
a) RNA polymerase b) Reverse transcriptase
c) DNA polymerase d) Transferase
- 13) Different forms of the same gene are called as
a) gamets b) alleles c) phenotypes d) genotypes
- 14) The initial source for all genetic variation is
a) mutation b) conjugation c) transduction d) transformation

2. Answer **any seven** of the following.

14

- i) Define exogenote
- ii) Define is mutation
- iii) Define recon
- iv) Define transduction
- v) Define phenotypes
- vi) Define plasmid
- vii) What is photo reactivation ?
- viii) Define Interrupted genes.



3. A) Answer **any two** of the following. 10
- a) Describe briefly replica plate technique.
 - b) Discuss the replication of bacterial genetic material.
 - c) Briefly explain transformation.
- B) Discuss in brief properties types and applications of plasmids. 4
4. Attempt **any two** of the following. 14
- i) Explain in detail mechanism of mutagenesis.
 - ii) Discuss the chemical nature of DNA and add a note on its function.
 - iii) Give the detailed account of properties of genetic code.
5. Attempt **any two** of the following. 14
- i) Explain in detail basic concept of genome.
 - ii) Give the detailed account of fate of Exogenote.
 - iii) Describe briefly Frame shift mutations.
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B.Sc. (Part – II) (Semester – IV) Examination, 2017
CHEMISTRY
Paper – V : Physical Chemistry (CGPA)

Time : 2½ Hours

Max. Marks : 70

- Instructions:** 1) **All** questions are **compulsory**.
2) Draw **neat** diagram and give equations **wherever** necessary.
3) Figures to the **right** indicate **full** marks.

1. Choose the most correct alternative of the following and rewrite the sentences : **14**
- 1) Which of the following molecule is expected to have finite dipole moment ?
a) CH₄ b) H₂ c) CO₂ d) NH₃
 - 2) In an adiabatic expansion of an ideal gas
a) q = 0 b) dT = 0 c) dE = 0 d) w = 0
 - 3) Following are the four solutions of NaCl. Which will have the highest value of specific conductance ?
a) 0.001 M b) 0.01 M c) 0.1 M d) 1.0 M
 - 4) Each Na⁺ ion in NaCl crystal lattice is surrounded by _____ Cl⁻ ions.
a) 1 b) 2 c) 4 d) 6
 - 5) Body centered cubic lattice consists of _____ points at corners.
a) 2 b) 4 c) 6 d) 8
 - 6) Unit of specific resistance is
a) ohm cm⁻¹ b) mho cm c) ohm⁻¹ cm⁻¹ d) ohm cm
 - 7) sin i/sin r is known as _____ law.
a) Raoult's b) Henry's c) Snell's d) Hook's
 - 8) Which of these is sparingly soluble salt ?
a) Silver halides b) Lead iodide
c) Barium sulphate d) All of these



3. A) Attempt **any two** of the following : **10**
- 1) Give physical significance of entropy.
 - 2) Derive the expression for Bragg's equation.
 - 3) Discuss optical exaltation with suitable example.
- B) Solve : **4**
- Calculate the entropy of mixing when Neon and Xenon gases mixed together with mole fractions $\frac{2}{5}$ and $\frac{3}{5}$ respectively.
4. Attempt **any two** of the following : **14**
- 1) Explain the application of Kohlrausch's law for the determination of solubility of sparingly soluble salts.
 - 2) Describe the entropy change for physical transformations.
 - 3) Give the principle of moving boundary method. In a moving boundary experiment with 0.1 N NaCl solution using 0.5 N CdCl_2 as an indicator solution. A constant current of 0.06 amp was passed for 10 min. The boundary was moved by 5 cm in a tube having cross section area 0.2 cm^2 . Calculate the transport numbers of Na^+ and Cl^- ions.
5. Attempt **any two** of the following : **14**
- 1) Describe principle, construction and working of Abbe's refractometer.
 - 2) Explain the laws of crystallography in detail.
 - 3) What do you mean by ionic product of water ? Explain how Kohlrausch law is used in deriving the ionic product of water.
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B.Sc. – II (Semester – IV) (CGPA) Examination, 2017
CHEMISTRY (Paper – VI)
Analytical and Industrial Inorganic Chemistry

Time : 2.30 Hours

Max. Marks : 70

- Instructions :** 1) **All questions are compulsory.**
2) **Draw neat labelled diagram wherever necessary.**
3) **Figures to the right indicate full marks.**

1. Select the most alternative and rewrite the following sentences : **14**

- 1) The colour of the quinoid form of methyl orange is _____
 - a) red
 - b) yellow
 - c) pink
 - d) colourless
- 2) Phenolphthalein is _____
 - a) neutral
 - b) strong base
 - c) weak organic acid
 - d) weak inorganic acid
- 3) pH range of methyl orange indicator is _____
 - a) 3.1 to 4.4
 - b) 2.9 to 4.6
 - c) 6.3 to 7.1
 - d) 5.2 to 6.3
- 4) BaSO_4 is mostly _____ precipitate.
 - a) gelatinous
 - b) amorphous
 - c) crystalline
 - d) curdy
- 5) Al(OH)_3 is a _____ precipitate.
 - a) Gelatinous
 - b) Curdy
 - c) Crystalline
 - d) Amorphous
- 6) The oxine is a _____ chelating agent.
 - a) Unidentate
 - b) Tridentate
 - c) Bidentate
 - d) Polydentate
- 7) The catalytic reactions caused by _____ are called acid catalysis.
 - a) Water
 - b) Acid
 - c) Base
 - d) Alcohol

P.T.O.



- 7) Define the term :
- i) Precipitation
 - ii) Coagulation.
- 8) What is Acid-Base indicator ?
- 9) Give the types of EDTA Titrations.
3. A) Attempt **any two** of the following : **10**
- 1) State and explain criteria of catalysis.
 - 2) Draw a neat labeled diagram of manufacturing plant for ammonia by Habers process.
 - 3) Give the merits and demerits of Bessemer process.
- B) Explain, why L.D. process is superior to Bessemer process. **4**
4. Answer **any two** of the following : **14**
- 1) What are the types of EDTA titrations ? Explain in detail direct titration.
 - 2) Discuss the conditions for good precipitation in gravimetric analysis.
 - 3) Explain physics-chemical principle of contact process.
5. Answer **any two** of the following : **14**
- 1) Explain in detail ion exchange method.
 - 2) Discuss the mechanism of precipitate formation.
 - 3) Explain in brief theory of acid-base indicator.
-



2. Answer **any seven** of the following : **14**
- i) What are principle points and principle planes of lens system ?
 - ii) Define lateral and angular magnification.
 - iii) What is diffraction of light ? Give its types.
 - iv) Compare geometrical and spectral resolution.
 - v) Draw the neat labeled diagram of Nicol prism.
 - vi) Define plane of polarization and specific rotation.
 - vii) What is optical fibre ? Give its types.
 - viii) What is superiority of F-P interferometer over Michelson interferometer ?
 - ix) What is the relation for visibility of fringes ?
3. A) Attempt **any two** of the following : **10**
- i) Derive expression for Lagrange's law.
 - ii) What is Rayleigh's criterion for resolution ? Distinguish between magnification and resolution.
 - iii) Describe polarimeter experiment to determine the specific rotation.
- B) Find the radius of first zone of the zone plate having focal length 20 cm with light of wavelength 5000 \AA . **4**
4. Attempt **any two** of the following : **14**
- i) Derive an expression for the resolving power of a prism.
 - ii) Explain the formation and working of fibre optics communication system.
 - iii) Describe construction of image and obtain Newton's formula for lens system.
5. Attempt **any two** of the following : **14**
- i) For the zone plate prove that the principal focal length is given by $f_n = r_n^2 / n\lambda$.
 - ii) What is double refraction ? Give the Huygens wave theory of double refraction in uniaxial crystal.
 - iii) Explain construction and working of Michelson's interferometer.
-



- viii) The value of change in Compton wavelength $d\lambda =$
a) 0.0242 A.V. b) 0.242 A.V. c) 2.42 A.V. d) 24.2 A.V.
- ix) In chain reaction if the effective multiplication factor $K = 1$, then the size and mass of core is
a) Critical b) Super critical c) Sub critical d) Infinity
- x) The magnitude of energy released per fission is about
a) 100 MeV b) 200 MeV c) 300 MeV d) 400 MeV
- xi) Mass of moving object always
a) Increases b) Decreases
c) Remains the same d) Becomes zero
- xii) According to Hundt's rule, the electrons in sub shell have _____ spin whenever possible.
a) Parallel b) Perpendicular c) Antiparallel d) Crossed
- xiii) Maximum number of electrons in any shell is given by
a) $2n$ b) $2n^2$ c) n^2 d) $2n^3$
- xiv) The common material used as a fuel in nuclear reactor is
a) Cadmium b) Lanthanum c) Lithium d) Uranium

2. Solve **any seven** of the following :

14

- i) Write Lorentz transformation equations.
- ii) Write note on time dilation.
- iii) State any one hypothesis of matter waves.
- iv) Write four properties of matter waves.
- v) What is L-S coupling ?
- vi) State Pauli's exclusion principle.
- vii) What is Compton effect ?
- viii) Write any one neutron induced nuclear reaction.
- ix) What is nuclear fission ?



3. A) Attempt **any two** of the following : **10**
- i) Deduce an expression for relativistic variation of length with velocity.
 - ii) A particle is moving with velocity 150 m/s. Calculate group velocity and phase velocity of matter waves.
 - iii) Describe experimental study of Normal Zeeman effect.
- B) At what speed will the mass of body be 1.25 times it's rest mass ? **4**
4. Attempt **any two** of the following : **14**
- i) Derive Einstein's mass energy relation.
 - ii) Explain construction and working of Stern and Gerlach experiment.
 - iii) Explain experimental verification of compton effect.
5. Attempt **any two** of the following : **14**
- i) Derive relativistic velocity addition theorem and prove the postulate of constancy of velocity of light.
 - ii) Explain quantum numbers associated with vector atom model.
 - iii) Explain construction and working of nuclear reactor.
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B.Sc. – II (Semester – IV) (CGPA) Examination, 2017
STATISTICS (Paper – V)
Continuous Probability Distributions and Exact Probability
Distributions

Time : 2½ Hours

Max. Marks : 70

Instructions: 1) **All** questions are **compulsory** and carry **equal** marks.
2) Figures to the **right** indicate **full** marks.

1. Choose the correct alternative : **14**

- 1) If m.g.f of a continuous r.v. X is $(1 - 4\lambda)^{-7}$ then the probability distribution of X is
- a) $G(7, \frac{1}{4})$ b) $G(\frac{1}{4}, 7)$ c) $G(4, 7)$ d) $G(7, 4)$
- 2) If $X \sim G(1/2, 1)$ then probability distribution of $\frac{X}{2}$ is
- a) $G(1, 1)$ b) Standard exponential
c) Both a) and b) d) None of these
- 3) If $X \sim \beta_2(m, n)$ $1/X$ is
- a) $\beta_1(m, n)$ b) $\beta_2(n, m)$ c) $\beta_2(m, n)$ d) $\beta_1(n, m)$
- 4) If $X \sim \beta_1(2, 3)$ then $E(X) =$ _____
- a) 0.4 b) 0.04 c) 0.25 d) 0.15
- 5) If $X \sim N(0, 1)$, $Y \sim N(0, 1)$ are independent random variables then $E(X^2 + Y^2) =$
- a) 0 b) 1 c) 2 d) 4
- 6) The m.g.f. of X is $e^{-5t + \frac{25}{2}t^2}$, then the distribution of X is
- a) $N(0, 1)$ b) $N(5, 5)$ c) $N(-5, 5)$ d) $N(-5, 25)$



- 7) The variance of Chi square distribution with 10 d.f. is
 a) 10 b) 20 c) 30 d) 40
- 8) The relation between mean and variance of Chi square variate with n.d.f. is
 a) mean = 2 variance b) 2 mean = variance
 c) mean = variance d) None of these
- 9) If X is a t variate with 5 d.f. then variance of X is
 a) 3/5 b) 5/3 c) 4/3 d) 3/4
- 10) Let X_1, X_2, X_3 be i.i.d. $N(0, 1)$ variates and $Y = \sqrt{2} X_3 / \sqrt{(X_1^2 + X_2^2)}$ then $E(Y) =$
 a) $\sqrt{2}$ b) 1 c) 2 d) 0
- 11) If X is a t variate with n.d.f. then $E(X)$ is
 a) n b) $n/(n-2)$ c) 0 d) None of these
- 12) The t distribution is
 a) +vely skewed b) -vely skewed
 c) Symmetric d) None of these
- 13) If $F \sim F(10, 11)$ then $E(1/F)$ is
 a) 11/10 b) 11/9 c) 5/4 d) 11/8
- 14) If mode of $F(5, n_2) = 0.4$ then n_2 is
 a) 3 b) 4 c) 5 d) 6

2. Attempt **any seven** :

14

- 1) Define gamma distribution with two parameters.
- 2) State m.g.f. of $G(\alpha, \lambda)$.
- 3) State mean of $\beta_1(m, n)$.
- 4) State H.M. of $\beta_2(3, 4)$.
- 5) State mean and variance of X if $f(x) = \frac{1}{\sqrt{2\pi}} \exp(-\frac{1}{2}(x-5)^2)$; $-\infty < x < \infty$.



- 6) If $X \sim N(1, 4)$, $Y \sim N(2, 4)$ are independent variates then state p.d.f. of $Z = X + 2Y$.
- 7) State mode of $F(n_1, n_2)$.
- 8) Define t-variate with n.d.f.
- 9) State additive property of Chi square distribution with n.d.f.

3. A) Attempt **any two** : **10**

- 1) If $X_1 \sim N(0, 1)$, $X_2 \sim N\left(0, \frac{1}{2}\right)$ and are independent then find the distribution of $(X_1^2 + 2X_2^2)$.
- 2) If $X \sim \beta_1(m, n)$ then find distribution of $(1 - X)$.
- 3) Find mode of Chi square variate with n.d.f.

B) If X is a t-variate with n.d.f. show that $Y = X^2$ follows F distribution with $(1, n)$ d.f. **4**

4. Attempt **any two** : **14**

- 1) If $X \sim \beta_2(m, n)$ distribution of $X/(1 + X)$.
- 2) If $X \sim N(\mu_1, \sigma_1^2)$, $Y \sim N(\mu_2, \sigma_2^2)$ and are independent then find distribution of $Y = AX + BY + C$, where A, B and C are constants.
- 3) Derive the p.d.f. of Chi square variate with n.d.f.

5. Attempt **any two** : **14**

- 1) Prove that sum of i.i.d. exponential variates is a gamma variate.
 - 2) Let the p.d.f. of a normal variate be $f(x) = K \exp[-1/18(x^2 - 10x + 25)]$; $K > 0, -\infty < x < \infty$ find the values of K , mean and variance of X .
 - 3) Find mode of F – variate with (n_1, n_2) d.f.
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B.Sc. – II (Semester – IV) (CGPA Pattern) Examination, 2017
STATISTICS (Paper – VI)
Applied Statistics

Time : 2½ Hours

Max. Marks : 70

Instructions: i) **All questions are compulsory.**
ii) **Figures to the right indicate full marks.**

1. Choose the correct alternative : **14**
- i) Sampling is unavoidable in the situation(s)
a) Blood test of a person b) When the population is infinite
c) Testing of life of a dry battery cell d) a), b) and c)
- ii) Probability of drawing an unit at any draw remains same in
a) SRSWOR b) SRSWR
c) Both a) and b) d) None of these
- iii) An unordered sample of size n can occur in
a) n ways b) n! ways c) one way d) n^2 ways
- iv) The number of all possible samples of size 3 from a population of 5 units in SRSWR
a) 100 b) 243 c) 125 d) 10
- v) If the null hypothesis of test statistic Z is $N(0, 1)$ then for testing against a two sided alternative at $\alpha = 0.05$, reject H_0 if
a) $|Z| > 1.96$ b) $|Z| < 1.64$ c) $|Z| < 1.96$ d) None of these
- vi) Rejecting H_0 when it is true is
a) Type II error b) Type I error
c) Not committing error d) None of these
- vii) Whether a test is one sided or two sided depends on
a) Alternative hypothesis b) Composite hypothesis
c) Null hypothesis d) Simple hypothesis



- viii) For testing population proportions which of the following test to be used ?
a) Z-test b) χ^2 -test c) t-test d) F-test
- ix) Paired t-test is applicable when the observations in the two samples are
a) Paired b) Correlated
c) Equal in number d) a), b) and c)
- x) Degrees of freedom for statistic χ^2 in case of contingency table of order 2×2 is
a) 3 b) 4 c) 2 d) 1
- xi) For testing a population variance which of the following test to be used ?
a) Z-test b) t-test c) Chi-square test d) F-test
- xii) Control charts consist of
a) Three control lines b) Upper and lower control limits
c) The level of the process d) All of these
- xiii) The faults due to assignable causes
a) Can be removed
b) Cannot be removed
c) Can sometimes be removed without increase production cost
d) None of these
- xiv) The value of Gross Reproductive Rate (GRR) > 1 is indicative of
a) Increase in population b) Reduction in population
c) Population remains constant d) None of these

2. Attempt **any seven** of the following :

14

- i) Define the term statistic.
- ii) Describe sample survey.
- iii) Define composite hypothesis.
- iv) Define critical region.
- v) Explain one-tailed test.
- vi) Explain the term defective.
- vii) Explain the term assignable causes.
- viii) Define GRR.
- ix) Explain the need of vital statistics.



3. A) Attempt **any two** of the following : **10**
- i) State advantages of sampling method over census method.
 - ii) What is the meaning and purpose of Statistical Quality Control (SQC) ?
 - iii) State the procedure to test the equality of means for paired observations by using t-test.
- B) Define Crude Death Rate (CDR). State the merits and demerits of CDR. **4**
4. Attempt **any two** of the following : **14**
- i) Show that in case of SRSWOR, expected value of the sample mean is population mean.
 - ii) Explain the criteria of detecting lack of control in \bar{X} and R charts.
 - iii) Explain Age-specific Fertility Rate and Total Fertility Rate (TFR). Also state the limitations of TFR.
5. Attempt **any two** of the following : **14**
- i) With usual notations, prove that in SRSWOR,
- $$V(\bar{y}_n) = \frac{N-n}{Nn} S^2$$
- ii) Explain clearly the control limits of R-chart when standards are not given.
 - iii) Describe the procedure for testing
 - a) $H_0 : P = P_0$ against $H_1 : P \neq P_0$ and
 - b) $H_0 : P_1 = P_2$ against $H_1 : P_1 \neq P_2$ based on normal distribution.
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B.Sc. – II (Semester – IV) Examination, 2017
MATHEMATICS (Paper – V)
Differential Equation (CGPA Pattern)

Time : 2½ Hours

Max. Marks : 70

Instructions: 1) **All questions are compulsory.**
2) **Figures to the right indicate full marks.**

1. Select the correct alternative for **each** of the following : **14**

1) The solution of the differential equation $y = px + f(p)$ is

- a) $y = cx - f(c)$ b) $y = cx + f(x)$ c) $y = cx + f(c)$ d) None of these

2) The solution of the differential equation $p^2 - 9p + 18 = 0$ is

- a) $(y - 6x - c)(y - 3x - c) = 0$ b) $y = 3x + c$
c) $y = 6x + c$ d) $(y + 6x + c)(y + 3x + c) = 0$

3) The solution of differential equation $y = px + (1 - p)^2$ is

- a) $y = cx + (1 - c)^2$ b) $y = cx - (1 - c)^2$
c) $y = cx + (1 - x)^2$ d) None of these

4) By the substitution of $z = \log x$ in homogeneous equation $x^2 \frac{d^2y}{dx^2}$ has the value

- a) $z^2 \frac{d^2y}{dx^2}$ b) $z^2 \frac{d^2y}{dx^2} - z \frac{dy}{dx}$
c) $\frac{d^2y}{dz^2} - \frac{dy}{dz}$ d) $\frac{d^2y}{dz^2} + \frac{dy}{dz}$



- 5) C.F. of the differential equation $x^2 \frac{d^2y}{dx^2} - 4x \frac{dy}{dx} + 6y = x$ is
- a) $c_1x + c_2x^3$ b) $c_1x^2 + c_2x^2$ c) $c_1x^2 + c_2x^3$ d) $c_1x + c_2$
- 6) Homogeneous linear differential equation with variable coefficient can be reduced to linear differential equation with constant coefficient by changing the independent variable x to z by substitution
- a) $x = e^{-z}$ b) $x = e^z$ c) $z = e^x$ d) $z = e^{-x}$
- 7) If $P + Qx = 0$, then the solution of the equation $\frac{d^2y}{dx^2} + P \frac{dy}{dx} + Qy = 0$ is
- a) $y = e^x$ b) $y = e^{-x}$ c) $y = e^{2x}$ d) $y = e^{-2x}$
- 8) If $2 + 2Px + Qx^2 = 0$, then the solution of the differential equation $\frac{d^2y}{dx^2} + P \frac{dy}{dx} + Qy = 0$ is
- a) $y = 2x$ b) $y = -2x$ c) $y = -x^2$ d) $y = x^2$
- 9) If $u = e^x$ is known solution of the differential equation $x^2 \frac{d^2y}{dx^2} - 2(x+1) \frac{dy}{dx} + (x+2)y = (x-2)e^{2x}$ is obtained by the inspection
- a) $1 + P + Q = 0$ b) $1 - P + Q = 0$ c) $P + Qx = 0$ d) $2 + 2Px + Qx^2 = 0$
- 10) The complete solution of the equation $\frac{dx}{yz} = \frac{dy}{zx} = \frac{dz}{xy}$ is
- a) $\phi(x - y, yz) = 0$ b) $\phi(x - y^2, y - z^2) = 0$
- c) $\phi(x^2 - y, y^2 - z) = 0$ d) $\phi(x^2 - y^2, y^2 - z^2) = 0$
- 11) The general solution of the differential equation $4xdx - 3y^2dy + 4zdz = 0$ is
- a) $4x^2 - 3y^3 + 4z^2 = c$ b) $2x^2 - y^3 + 2z^2 = c$
- c) $2x^2 + y^3 + 2z^2 = c$ d) $4x^2 + y^3 + 4z^2 = c$



12) The one solution of the equation $\frac{dx}{xz} = \frac{dy}{yz} = \frac{dz}{(x+y)^2}$ is

a) $\log\left(\frac{x}{y}\right) = c_1$

b) $\log(xy) = \log c_1$

c) $\log(xyz) = \log c_1$

d) $\log(x^2y^2) = \log c_1$

13) A differential equation of the type _____ is called total differential equation.

a) $P + Q + R = 0$

b) $Pdx + Qdy - Rdz = 0$

c) $P + Qdy + Rdz = 0$

d) $Pdx + Qdy + Rdz = 0$

14) The general solution of the equation $dx + dy + dz = 0$ is

a) $x + y - z = c_1$

b) $x - y + z = c_1$

c) $x - y - z = c_1$

d) $x + y + z = c_1$

2. Solve **any seven** of the following :

14

1) Solve $x^2p^2 + 3xyp + 2y^2 = 0$.

2) Solve $p^2 - 5p + 6 = 0$.

3) Solve $p = \log(px - y)$.

4) Solve $x^3 \frac{d^2y}{dx^2} - 2x^2 \frac{dy}{dx} + 2xy = 1$.

5) Obtain the known solution of the differential equation

$$x \frac{d^2y}{dx^2} - 2(x+1) \frac{dy}{dx} + (x+2)y = (x-2)e^{2x}.$$

6) Obtain the Q_1 of the linear differential equation of the second order

$$\frac{d^2y}{dx^2} + 2x \frac{dy}{dx} + (x^2 - 8)y = x^2 e^{-x^2/2}.$$

7) Solve $\frac{dx}{y+z} = \frac{dy}{z+x} = \frac{dz}{x+y}$.

8) Solve $\frac{dx}{yz} = \frac{dy}{zx} = \frac{dz}{xy}$.

9) Write the condition of integrability of the total differential equation $Pdx + Qdy + Rdz = 0$.



3. A) Attempt **any two** of the following : 10

1) Solve $p^2 - 2p \cosh x + 1 = 0$.

2) Solve $x^2 \frac{d^2y}{dx^2} + x \frac{dy}{dx} - 9y = 0$, if $y = x^3$ is its known integral.

3) Define homogeneous linear differential equation of order n and explain the method of solving it.

B) Define Clairaut's differential equation and explain the method of its general solution. 4

4. Attempt **any two** of the following : 14

1) Explain the method of solving simultaneous differential equation

$$\frac{dx}{P} = \frac{dy}{Q} = \frac{dz}{R} \text{ and solve } \frac{dx}{z} = \frac{dy}{-z} = \frac{dz}{z^2 + (x+y)^2}.$$

2) Explain how to solve the second order differential equation $\frac{d^2y}{dx^2} + P \frac{dy}{dx} + Qy = R$,

Where P, Q, R are the functions of x only when one solution belonging to C.F. is known.

3) Solve $(yz + 2x) dx + (zx - 2z) dy + (xy - 2y) dz = 0$.

5. Attempt **any two** of the following : 14

1) Explain the method of solving the differential equation

$$(a + bx)^n \frac{d^n y}{dx^n} + P_1 (a + bx)^{n-1} \frac{d^{n-1} y}{dx^{n-1}} + \dots + P_{n-1} (a + bx) \frac{dy}{dx} + P_n y = X.$$

Where P_1, P_2, \dots, P_n are constants and X is a function of x only.

2) Explain the method of solving the equation $\frac{d^2y}{dx^2} + P \frac{dy}{dx} + Qy = R$,

where P, Q, R are the functions of x only, by changing the dependent variable y to v .

3) Solve $\frac{adx}{(b-c)yz} = \frac{bdy}{(c-a)zx} = \frac{cdz}{(a-b)xy}$.



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B.Sc. – II (Semester – IV) (CGPA) Examination, 2017
MATHEMATICS (Paper – VI)
Abstract Algebra – I

Time : 2 ½ Hours

Max. Marks : 70

- N.B. :** 1) **All questions carry equal marks.**
2) **All questions are compulsory.**
3) **Figures to the right indicate full marks.**

1. Choose the correct alternative of the following. **14**

- 1) A cycle of length two is called _____
a) Permutation b) Transposition c) Combination d) None of these
- 2) A non-empty set together with binary operation $*$ which satisfies closure as well as associative property is called _____
a) Groupoid b) Semi group c) Monoid d) None of these
- 3) (\mathbb{N}, \bullet) is not group since it does not satisfy following property _____
a) Closed b) Associative c) Inverse d) None of these
- 4) Congruent modulo n is defined as _____
a) $p = q \pmod{n}$ b) $p \sim q \pmod{n}$ c) $p \equiv q \pmod{n}$ d) none of these
- 5) In division Algorithm $P = mq+r$ _____
a) $0 \leq r < p$ b) $0 \leq r < m$ c) $0 \leq r \leq q$ d) None of these
- 6) A relation ' \sim ' is symmetric if for $p, q \in S$ _____
a) $p \sim q \Rightarrow p \sim p$ b) $p \sim q \Rightarrow q \sim p$ c) $p \sim q \Rightarrow q \sim q$ d) None of these
- 7) The following element is not the generator of Z_9 _____
a) 1 b) 2 c) 3 d) None of these
- 8) The value of expression $[2] \odot [4]$ in Z_5 is _____
a) [2] b) [4] c) [3] d) None of these



- 9) The product of g.c.d. and l.c.m. of 20 and 15 are _____
 a) 200 b) 300 c) 100 d) None of these
- 10) A sub group containing only the identity element of the group G is called _____
 a) Trivial b) Non-trivial c) Abelian d) None of these
- 11) A finite group of prime order is _____
 a) cyclic b) not cyclic c) normal d) none of these
- 12) Let I be the set of all integers with operation defined by $a*b = a+b+1$ then identity is _____
 a) 1 b) -1 c) 0 d) None of these
- 13) $x(1, 3, 2) = (1, 3)$ in S_3 then $x =$ _____
 a) (2, 3) b) (1, 2) c) (3, 1) d) None of these
- 14) Let $f : G \rightarrow G'$ be a homomorphism then $\ker f =$ _____
 a) $\{x \in G / f(x) = e'\}$ b) $\{x \in G / f(x) = e\}$
 c) $\{x \in G / f(x) = x\}$ d) None of these

2. Attempt **any seven** of the following.

14

- 1) For permutation $\sigma = \begin{pmatrix} 1 & 2 & 3 & 4 & 5 & 6 \\ 3 & 1 & 4 & 5 & 6 & 2 \end{pmatrix}$ and $\tau = \begin{pmatrix} 1 & 2 & 3 & 4 & 5 & 6 \\ 2 & 4 & 1 & 3 & 6 & 5 \end{pmatrix}$.

Compute $\tau^2\sigma$.

- 2) Write a Cayley table of the group (G, \bullet) where $G = \{1, w, w^2\}$.
- 3) Define quotient group.
- 4) Determine the right cosets of $\langle [4] \rangle$ in Z_8 .
- 5) Define group.
- 6) If a, b are any two elements of group G then equation $ax = b$ have unique solution.
- 7) Find order of all elements of group $\{1, 2, 3, 4\}$ under X_5 .



8) If $a, b, c \in G$ and $ab = ac$ then show that $b = c$.

9) Compute $[[3] \odot [3]] \oplus [[3] \odot [4]]$ in Z_5 .

3. A) Attempt **any two** of the following. **10**

1) If $\alpha = \begin{pmatrix} 1 & 2 & 3 & 4 \\ 1 & 4 & 3 & 2 \end{pmatrix}$ and $\beta = \begin{pmatrix} 1 & 2 & 3 & 4 \\ 3 & 1 & 4 & 2 \end{pmatrix} \in S_4$.

Compute :

i) $\alpha.\beta$ ii) $\alpha^{-1}\beta^{-1}$ iii) $\beta.\alpha$

2) Find G.C.D. of 616 and 427 and express $(616, 427) = 616 m + 427 n$.

3) Show that every cyclic group is abelian.

B) Does the following set forms a group ? **4**

$(I, *)$ and $*$ is defined by $a*b = a + b + 1$

4. Attempt **any two** of the following. **14**

1) If G and H are groups and $\theta: G \rightarrow H$ is a homomorphism then $\ker \theta$ is normal subgroup of G .

2) Show that if H and K are subgroup of a group G such that $HK = KH$ then HK is subgroup of G .

3) If R is additive group of positive numbers prove that the mapping $f: R \rightarrow R_+$ defined by $f(x) = e^x \forall x \in R$ is an isomorphism.

5. Attempt **any two** of the following. **14**

1) State and prove Lagrange's theorem.

2) State and prove Cayley's theorem.

3) Prove that for every element in a group G $a^2 = e$ then G is abelian.



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B.Sc. II (Semester – IV) (CGPA Pattern) Examination, 2017
GEOGRAPHY
Paper No. – V : Biogeography

Time : 2½ Hours

Max. Marks : 70

- N.B. :** 1) **All questions are compulsory.**
2) Draw **neat** maps and diagrams **wherever** necessary.
3) **Use** of map stencil is allowed.

1. Choose and write a correct from given **four** alternatives. **14**
- 1) The book entitled 'The origin of life' is authored by _____ in 1936.
(Uprin, Orgel, Darwin, Tayler)
 - 2) _____ islands show distinct species of plants and animals.
(Isolated, Connected, Linked, Grouped)
 - 3) Invertebrates had their origin in _____
(Lakes, Rivers, Ponds, Oceans)
 - 4) Extreme climate is one of the reasons for _____ migration of birds.
(Seasonal, Gradual, Rapid, Forceful)
 - 5) _____ is a type of conservation of forest resources.
(Gardening, Lumbering, Social Forestry, Cutting)
 - 6) _____ prevention and control act was enforced in 1981.
(Water, Air, Noise, Environment)
 - 7) The paleo records of life history are well preserved in _____ rocks.
(Sedimentary, Intrusive, Extrusive, Weathered)
 - 8) _____ is prohibited in areas of wildlife sanctuary.
(Walking, Running, Hunting, Watching)
 - 9) The _____ grasslands best support the activity of livestock farming in the world.
(Tropical, Temperature, Polar, Mansoonal)
 - 10) The history of the _____ of forest is as old as man himself.
(Conservation, exploitation, Aforestation, Distortion)
 - 11) The water born diseases are caused by _____ water.
(Polluted, Purified, Oxygenated, Rain)

P.T.O.



- 12) _____ is the valuable tree in tropical deciduous forest.
(Teak, Oak, Pine, Rosewood)
- 13) The increasing number of automobiles has become a cause of _____ pollution.
(Water, Air, Land, Soil)
- 14) Sanjay Gandhi National Park is located in
(Gohatti, Borevali, Chandrapur, Bandipur)

2. Answer **any five** of the following. **15**
- 1) Water pollution effects.
 - 2) Commercial fishing.
 - 3) Dispersal of birds.
 - 4) Define the migration.
 - 5) Name any four of organic resources.
 - 6) Causes of migration.
3. Answer **any three** of the following. **15**
- 1) Evolution of animals.
 - 2) Causes of pollution.
 - 3) Use of marine resources.
 - 4) Effects of air pollution.
4. Answer **any three** of the following. **15**
- 1) Environmental protection of laws.
 - 2) Effects of human activities on animals.
 - 3) Acid rains.
 - 4) Different uses of forest products in industry.
5. A) Answer **any one** of the following long answer questions. **6**
- 1) Write the Darwin theory of life evolution.
 - 2) Geological time scale and life evolution.
- B) Answer **any one** of the following long answer questions. **5**
- 1) Barriers of migration.
 - 2) Classification of resources.
-



- ix) In ideal differential amplifier, common mode gain is _____
 a) zero b) unity c) high d) infinity
- x) An input bias current I_B is _____
 a) $I_{B_1} + I_{B_2}$ b) $I_{B_1} - I_{B_2}$ c) $I_{B_2} - I_{B_1}$ d) $\frac{(I_{B_1} + I_{B_2})}{2}$
- xi) In op-amp inverting amplifier circuit, the inverting terminal voltage equal to _____
 a) input voltage b) zero voltage
 c) supply voltage d) output voltage
- xii) In phase shift oscillator op-amp is used in _____
 a) Non inverting mode b) Inverting mode
 c) Differential mode d) None of these
- xiii) Zero crossing detector is a comparator having _____
 a) $V_{ref} = 0V$ b) $V_{ref} = V_{CC}$
 c) $V_{ref} = -V_{EE}$ d) None of these
- xiv) In wien bridge oscillator the gain should be _____
 a) 29 b) 3 c) 10 d) 30

2. Attempt **any seven** of the following :

14

- i) Draw and label the schematic symbol for op-amp.
- ii) What are the non-linear applications of op-amp (any four).
- iii) In differential amplifier $V_1 = 100 \text{ mV}$, $V_2 = 200 \text{ mV}$, $A_d = 100$, calculate output voltage.
- iv) What is virtual ground ?
- v) Draw the equivalent circuit of an op-amp.
- vi) Draw circuit diagram of precision halfwave rectifier.
- vii) Define the terms slew rate and CMRR.
- viii) State any four ideal characteristics of an op-amp.
- ix) Explain need of differential amplifier.



3. A) Attempt **any two** of the following : **10**
- i) Explain the action of basic comparator.
 - ii) Explain current mirror bias.
 - iii) Explain op-amp as an adder.
- B) Design a weinbridge oscillator using op-amp for frequency $f = 965$ H.
Given $C = 0.05 \mu F$. **4**
4. Attempt **any two** of the following : **14**
- i) Explain op-amp used as an integrator.
 - ii) Explain Schmitt trigger using op-amp.
 - iii) Explain the need of constant current source in differential amplifier.
5. Answer **any two** of the following : **14**
- i) Explain astable multivibrator using op-amp. Derive the expression for frequency of oscillator.
 - ii) Explain phase shift oscillator using op-amp. Design the phase shift oscillator for frequency $f_0 = 200$ Hz. Given $C = 0.1 \mu F$.
 - iii) Explain op-amp used as differential amplifier (subtractor).
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B.Sc. – II (Semester – IV) Examination, 2017
GEOGRAPHY
AGRICULTURAL GEOGRAPHY (Paper No. – VI) (CGPA Pattern)

Time : 2½ Hours

Max. Marks : 70

- Instructions:** 1) **All questions are compulsory.**
2) **Draw neat maps and diagrams wherever necessary.**
3) **Use of map stencil is allowed.**

1. Choose and write a correct from given **four** alternatives. **14**
- 1) Agricultural geography is the sub branch of _____ geography.
A) Social B) Political C) Economic D) Historical
 - 2) _____ is believed to be an area of origin of agriculture.
A) S. E. Asia B) N. America C) Taiga D) Steppes
 - 3) The word agriculture comes from a Latin term
A) Agra B) Agercultura C) Ager D) Agro
 - 4) Capital is a _____ factor affecting agriculture.
A) Physical B) Economic C) Social D) Historical
 - 5) _____ is a social factor affecting agriculture.
A) Capital B) Climate C) Irrigation D) Land Holding
 - 6) Shifting cultivation is called _____ in North-East India.
A) Chena B) Ladang C) Zoom D) Penda
 - 7) Plantation Agriculture is mainly practiced in _____ area.
A) Temperate B) Tropical C) Equatorial D) Polar
 - 8) _____ farming agriculture involves crops and animals.
A) Mixed B) Subsistence C) Plantation D) Extensive
 - 9) The phenomenal growth in agriculture has been called as
A) Evolution B) White Revolution
C) Blue Revolution D) Green Revolution
 - 10) _____ approach is known as universal approach.
A) Deterministic B) Regional C) Systematic D) Ecological



- 11) Alkaline soils are formed due to _____ of water in the fields.
A) Logging B) Flowing C) Running D) Freezing
- 12) pH value of a soil is related with its
A) Fertility B) Salinity C) Texture D) Colour
- 13) _____ ranks first in the production of dairy products in the world.
A) Pakistan B) Denmark C) Kazakstan D) India
- 14) In India Swaminathan is the founder of _____ revolution.
A) Green B) Blue C) White D) Red

2. Answer **any five** of the following : **15**
- 1) Define agriculture geography.
 - 2) What is intensive agriculture ?
 - 3) Name any three physical determinants of agriculture.
 - 4) Any three characteristics of subsistence agriculture.
 - 5) What is Biotechnology ?
 - 6) Define sustainable agriculture.
3. Answer **any three** of the following : **15**
- 1) Explain the nature of agriculture geography.
 - 2) Describe the social determinants of agriculture.
 - 3) Write a note on organic farming.
 - 4) Write a note on green revolution in India.
4. Write **any three** of the following : **15**
- 1) Give a brief account of plantation agriculture.
 - 2) Explain the scope of agriculture geography.
 - 3) Describe the economic determinants of agriculture.
 - 4) Importance of dairy farming.
5. A) Answer **any one** of the following long answer question. **6**
- 1) State the major problems of agriculture in India.
 - 2) Importance of fruit processing industry.
- B) Answer **any one** of the following long answer question. **5**
- 1) Explain the characteristics of extensive agriculture.
 - 2) Explain various approaches to the study of agriculture geography.
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Seat No.	
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B.Sc. – II (Semester – IV) (CGPA) Examination, 2017
(Paper – VI) ELECTRONICS
Digital Techniques and Microprocessor

Time : 2½ Hours

Max. Marks : 70

- Instructions :** 1) *All questions are compulsory.*
2) *Figures to the right indicate full marks.*
3) *Use of calculator is permissible.*
4) *Draw neat labeled diagram whenever necessary.*

1. Choose correct alternative and rewrite the sentence : **14**
- 1) The memory chip IC 6264 is a
a) SRAM b) EEPROM c) DRAM d) UVEPROM
 - 2) A 4 bit binary weighted digital to analog converter, if $8K\Omega$ resistor is connected at LSB position, then the value of resistor at MSB position is
a) $32K\Omega$ b) $16K\Omega$ c) $1K\Omega$ d) $4K\Omega$
 - 3) _____ IC is a tri state Uni-directional buffer.
a) 74244 b) 74245 c) 74138 d) 74373
 - 4) The address bus capacity of 8085 microprocessor is _____ bit.
a) 8 b) 32 c) 16 d) 12
 - 5) _____ instruction is a single byte instruction.
a) IN 03 b) LXI H, 2345 c) ADD B d) MVI A, 07
 - 6) A memory cell in DRAM includes
a) Flip-flop b) Capacitor
c) Fuse d) Magnetic domain
 - 7) In R-2R ladder network DAC, the input resistance for each input is
a) R b) 3R c) 4R d) 2R



- 8) _____ consists of programmable AND gates and OR gates.
a) PLA b) PAL c) PROM d) PGM
- 9) _____ interrupt has highest priority in maskable interrupt of 8085.
a) RST 5.5 b) INTR c) RST 6.5 d) RST 7.5
- 10) The width of program counter is _____ bit.
a) 16 b) 8 c) 12 d) 4
- 11) _____ instruction is a logical group of instruction.
a) MOV M, A b) INR D c) CMA d) ADI 05
- 12) The suitable crystal frequency for 8085 microprocessor is
a) 8 MHz b) 6 MHz c) 12 MHz d) 10 MHz
- 13) _____ IC is called as trans-receiver.
a) 74245 b) 74373 c) 8085 d) 74244
- 14) _____ instruction is a machine control group of instruction.
a) RAL b) RST c) CMA d) RAR

2. Attempt **any seven** of the following :

14

- 1) Give the basic difference between RAM and ROM.
- 2) Define Accuracy and settling time for DAC.
- 3) Explain in brief the concept of programmable logic array.
- 4) Define fetch cycle and execution cycle of instruction.
- 5) Enlist interrupt related pins of 8085 processor.
- 6) Enlist any four 2 byte instructions of 8085 processor.
- 7) Write note on role of Program Counter.
- 8) What happens when 8085 get reset ?

3. A) Attempt **any two** of the following :

10

- 1) What is flow chart ? Draw four symbols used in flow chart with their meaning.
- 2) Explain in brief the concept of FPGA.
- 3) Compare IO mapped IO scheme with memory mapped IO scheme (five point).

B) Find out the analog output for 4 bit R-2R ladder network DAC if 0 = 0 volt and 1 = 5 volt for digital input 1) 1011 and 2) 0110.

4



4. Attempt **any two** of the following : **14**

i) Explain with suitable diagram how multiplexed address/data bus is de-multiplexed with the help of IC 74373.

ii) Write the functions of following pin.

1) ALE 2) $\text{IO}/\overline{\text{M}}$ 3) READY

4) S_0 and S_1 5) $\overline{\text{RESET IN}}$ 6) $\overline{\text{WR}}$

iii) Write assembly language program to transfer the block of 10 memory location starting from 2050, to memory location 2070 with flow chart.

5. Attempt **any two** of the following : **14**

i) What is addressing mode ? Explain different types of addressing modes supported by 8085 Processor with suitable examples.

ii) Draw the internal block diagram of 8085 processor and explain ALU, with Accumulator, Flag register and General Purpose Register.

iii) Explain the working principle of SAR type ADC.



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B.Sc. – II (Semester – IV) (CGPA) Examination, 2017
COMPUTER SCIENCE (Paper – V)
Data Structures

Time : 2.30 Hours

Total Marks : 70

Instructions: 1) **All questions are compulsory.**
2) **Figures to the right indicate full marks.**

1. A) Choose the correct alternatives :

6

- 1) _____ is the postfix form of infix expression : $A + (B * C)$.
a) $ABC + *$ b) $AB + C *$ c) $ABC * +$ d) $AB * C + *$
- 2) Array element are stored in memory by _____ manner.
a) Random b) Non-sequential
c) Sequential d) None
- 3) Double circular linked contains _____ NULL links.
a) One b) Two c) Three d) Zero
- 4) _____ algorithm is frequently used when the total number of elements is small.
a) Heap sort b) Insertion sort c) Bubble sort d) Quick sort
- 5) _____ algorithm is used to arrange the data elements.
a) Searching b) Sorting c) Merging d) Arranging
- 6) The root is processed before its subtrees in _____ traversal.
a) Preorder b) Inorder c) Postorder d) All of these

B) Fill in the blanks :

4

- 1) A mathematical model with the collection of operation defined on that model is called _____
- 2) In AVL Tree, the Balance Factor of each node is either _____
- 3) In _____ type of BST traversal we get the sorted data.
- 4) _____ searching requires sorted data.



- C) State **True/False** : **4**
- 1) Queue works in LIFO manner.
 - 2) Linked list provides sequential access.
 - 3) In array we can store multiple types of data.
 - 4) We can implement queue by using linked list.
2. Solve **any seven** from the following : **14**
- 1) Define stack. Give its examples.
 - 2) Define the term overflow and underflow.
 - 3) What is strictly binary tree ? Give its example.
 - 4) What is hashing ?
 - 5) Define height of tree. Give its example.
 - 6) Define the term predecessor and successor.
 - 7) What is sorting ? What are the methods of sorting ?
 - 8) What are the applications of stack ?
 - 9) What is advantage of circular queue over linear queue ?
3. A) Attempt **any two** : **10**
- 1) Explain the various operations on linear queue.
 - 2) Write a program to accept an array of integers and display in reverse order.
 - 3) Explain abstract data type with example.
- B) Explain the difference between stack and queue. **4**
4. Solve **any two** : **14**
- 1) Write a program to implements stack using array.
 - 2) What is linked-list explain the various types of linked-list ?
 - 3) Explain threaded binary tree with example.
5. Solve **any two** : **14**
- 1) Write a program to implement different tree traversal techniques.
 - 2) Write a program to implement insertion sort.
 - 3) Explain the technique of binary searching with example.
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B.Sc. – II (Semester – IV) (CGPA) Examination, 2017
COMPUTER SCIENCE
System Analysis and Design (Paper – VI)





Time : 2½ Hours

Max. Marks : 70

Instructions : 1) **All questions are compulsory.**
2) **Figures to the right place indicate full marks.**

1. Choose correct alternatives : **14**
- 1) _____ provides the controller with information for action.
 - a) Interface
 - b) Environment
 - c) Feedback
 - d) None of these
 - 2) A television is _____ system.
 - a) Open
 - b) Expert
 - c) Closed
 - d) TPS
 - 3) Context diagram contains single process.
 - a) True
 - b) False
 - 4) White box testing is also called
 - a) Glass box testing
 - b) Green box testing
 - c) Functional testing
 - d) None
 - 5) _____ are sometimes referred as 'Bubble Diagram'.
 - a) Flowchart
 - b) ER- Diagram
 - c) Decision table
 - d) DFD
 - 6) Record review is performed only in beginning of the study of the system.
 - a) True
 - b) False
 - 7) If system is in routine in nature then it gives positive feedback.
 - a) True
 - b) False



- 8) FFT stands for
- a) Fact For Technique b) Fact Finding Technique
c) Future Function Technique d) None of these
- 9) A graphical representation of an information system is called
- a) Data flow diagram b) Pictogram
c) Histogram d) Decision table
- 10) Open system does not interacts with environment.
- a) True b) False
- 11) The longest method of conversion is
- a) Direct b) Parallel c) Pilot d) Phased
- 12) In an ER-Diagram to represent an attribute we use
- a) Rectangle b) Ellipse
c) Diamond d) Line
- 13) _____ symbol is used to show any printed document input or output.
- a)  b)  c)  d) 
- 14) _____ includes review of the existing procedure and information flow.
- a) Feasibility study b) Feasibility report
c) System analysis d) System design

2. Answer **any seven** of the followings :

14

- 1) Write the characteristics of a system.
- 2) Draw the symbols of DFD.
- 3) What is Implementation ?
- 4) State the principles of flowcharting.
- 5) Define white box testing.
- 6) Write the difference between open and closed system.
- 7) What is system analysis ?
- 8) Define Decision tree.
- 9) What is Feedback ?



3. A) Attempt **any two** of the followings : **10**
- 1) Explain various types of system.
 - 2) Draw an ER-diagram for College Admission System.
 - 3) Explain the different roles of system analyst.
- B) Explain feasibility study in detail. **4**
4. Answer **any two** of the followings : **14**
- 1) Define the term Entity, Attribute and Relationship with example.
 - 2) What is decision table ? State the merits and demerits of decision tables.
 - 3) What is file ? Explain different types of files.
5. Answer **any two** of the followings : **14**
- 1) What is normalization ? Explain 1NF, 2NF and 3NF in brief.
 - 2) Draw a CLD and first level DFD for Payroll System.
 - 3) Explain Top-down incremental implementation. State its advantages and disadvantages.
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B.Sc. – II (Semester – IV) (CGPA) Examination, 2017
BIOCHEMISTRY (Paper – III)
Nutrition and Metabolism

Time : 2½ Hours

Max. Marks : 70

- N.B. :** 1) *All questions are compulsory.*
2) *Figures to the right indicate full marks.*
3) *Write biochemical reactions wherever necessary.*

1. Write following sentences by selecting most correct answer from the given options :

14

- 1) Transamination reaction involves transfer of amino group from amino acid to _____ acid.
- a) δ – keto b) β – keto c) α – keto d) γ – keto
- 2) All spontaneous reactions proceed with _____ in free energy.
- a) increase b) decrease c) equilibrium d) zero value
- 3) Metabolic acidosis results due to _____ concentration in free energy.
- a) increase in HCO_3^- b) decrease in HCO_3^-
c) increase in H_2CO_3 d) decrease in H_2CO_3
- 4) One mole of ATP on hydrolysis gives _____ Kcal energy.
- a) 7.3 b) 3.7 c) 8.3 d) 3.8
- 5) _____ amino acid is involved in urea cycle.
- a) valine b) tyrosine c) arginine d) glycine
- 6) _____ are non-essential food components in diet.
- a) Carbohydrates b) Proteins c) Vitamins d) Lipids

P.T.O.



- 7) Write free energy concept.
- 8) How γ -amino butyrate is obtained from L-glutamate by using PLP ?
- 9) Explain phosphate buffer system in the body.
3. A) Attempt **any two** of the following : **10**
- 1) Write a note on respiratory quotient.
 - 2) Discuss energetics in glycolysis.
 - 3) Write note on cytochromes.
- B) Draw a labelled diagram of constant volume adiabatic bomb calorimeter. **4**
4. Answer **any two** of the following : **14**
- 1) What is TCA cycle ? Write and explain in brief the reaction of TCA cycle.
 - 2) What is β -oxidation ? Write and explain reactions of β -oxidation of fatty acid palmitic acid.
 - 3) Explain compounds involved in electron transport (respiratory) chain.
5. Answer **any two** of the following : **14**
- 1) Define nutrition and balanced diet. Discuss the importance of proteins in diet.
 - 2) What is blood buffers ? How is the pH of blood buffered ?
 - 3) Define urea cycle. Write and explain the reactions of urea cycle.
-



Seat No.	
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B.Sc. – II (Semester – IV) (CGPA) Examination, 2017
PLANT PROTECTION (Paper – III)
Introduction to Weeds and Non-Insect Pests

Time : 2.30 Hours

Max. Marks : 70

- Instructions :** I) **All questions are compulsory.**
II) **Draw a neat labelled diagram wherever necessary.**
III) **Figures to the right indicate full marks.**
IV) **All questions carry equal marks.**

1. Rewrite the correct answer from the given alternatives : **(1×14=14)**
- 1) Any unwanted plant present in field is called as _____
a) weed b) keed c) feed d) seed
 - 2) Classification of weeds is based on _____
a) Cytology b) Ecology c) Genecology d) All of these
 - 3) _____ seeds are light in weight.
a) *Arachis* b) *Cicer* c) *Parthenium* d) *Cajanus*
 - 4) The example of parasitic weed is _____
a) *Albugo candida* b) *Cercospora personata*
c) *Casia auriculata* d) *Cuscuta reflexa*
 - 5) *Alternanthera tenella* weed controlled with the help of _____ weedicide.
a) 2,4-D b) 2,4-Z c) 2,4-C d) 2,4-G
 - 6) *Cynodon dactylon* weed belongs to the family _____
a) Myrtaceae b) Poaceae c) Apocynaceae d) Liliaceae
 - 7) There are _____ main methods of weed management.
a) Seven b) One c) Three d) Five
 - 8) In _____ method, superficial weeds are cut down from the field.
a) Hoeing b) Ploughing c) Mulching d) Harrowing
 - 9) Biological methods of weed management is done by using _____
a) Bacteria b) Virus c) Mycoplasma d) All of these
 - 10) The sodium salt is also known as _____
a) Bladex G b) Bladex B c) Dicotox d) Bladex C
 - 11) Gordian worms locally known as _____ worms.
a) thread b) bread c) tape d) earth

P.T.O.



Seat No.	
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B.Sc. – II (Sem. – IV) (CGPA) Examination, 2017
BIOCHEMISTRY (Paper – IV)
Molecular Biochemistry and Diseases

Time : 2½ Hours

Max. Marks : 70

- Instructions :** 1) **All questions are compulsory.**
2) **Figures to the right indicate full marks.**
3) **Draw Biochemical reactions/labelled diagrams wherever necessary.**

1. Write following sentences by selecting most correct answer from given options : **14**

- 1) First restriction map was obtained in _____ using Hin d II enzyme.
a) 1970 b) 1971 c) 1972 d) 1973
- 2) _____ is not a termination codon.
a) UAG b) UAA c) AUG d) UGA
- 3) Normal insulin concentration in plasma is
a) 20 – 30 μ U/ml b) 10 – 20 μ U/ml
c) 30 – 40 μ U/ml d) 40 – 50 μ U/ml
- 4) Natural UV rays from sun can cause cancer of
a) Blood cells b) Skin c) Lungs d) Bones
- 5) Translation means the process of biosynthesis of
a) Protein b) RNA
c) DNA d) Fats
- 6) The lac operon consists _____ as three structural genes.
a) K, L, M b) P, Q, R c) D, E, F d) Z, Y, A
- 7) Ampicillin and tetracycline resistant genes are present in _____ vector.
a) λ phase b) Modified λ -phage
c) Plasmid pBR 322 d) M 13 virus



3. A) Answer **any two** of the following : **10**
- 1) Explain production of insulin using gene cloning technique.
 - 2) Write note on tumor marker.
 - 3) Draw a labelled diagram of HIV and describe in brief.
- B) Describe pBR 322 as a cloning vector. **4**
4. Answer **any two** of the following : **14**
- 1) What are the salient features of genetic code ?
 - 2) Discuss the structure of immunoglobulin G(IgG).
 - 3) Explain the concept of lac operon.
5. Answer **any two** of the following : **14**
- 1) Explain types of diabetes mellitus.
 - 2) Explain Lambda phage vector of E. Coli.
 - 3) Explain three steps involved in transcription.
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B.Sc. – II (Semester – IV) (CGPA) Examination, 2017
PLANT PROTECTION (Paper – IV)
Insect Pests and their Management

Time : 2½ Hours

Max. Marks : 70

- Instructions :** I) **All questions are compulsory.**
II) Draw a **neat** labelled diagram **wherever** necessary.
III) Figures to the **right** indicate **full** marks.
IV) **All questions carry equal** marks.

1. Rewrite the correct answer from the given alternatives. **(1×14=14)**
- 1) The quantitative loss is _____ in yield of crop.
a) reduction b) production c) increase d) all of these
 - 2) _____ worm of cotton reduces the quality and quantity of crops.
a) Red boll b) Pink boll c) Green boll d) Brown boll
 - 3) The Jassids are the pests of
a) Gram b) Sugarcane c) Mango d) Jowar
 - 4) Classification of insect pests is based on
a) leg b) finger c) hand d) mouth
 - 5) The gross hopper defoliates crop and causes to _____ area.
a) photosynthetic b) chemosynthetic
c) phytosynthetic d) synthetic
 - 6) _____ is done by the mouth parts.
a) Soring b) Boring c) Goring d) Moring
 - 7) Moth larvae is also called as
a) cutworms b) wiveworms c) catterpillars d) grub
 - 8) _____ is a type of sprayer.
a) Navigator b) Magigator c) Agitator d) Fumigator
 - 9) Woolly aphids were recorded in India at Dehradun in _____ on bomboo plants.
a) 1910 b) 1909 c) 1908 d) 1907
 - 10) Jowar plant is attacked by _____ borer.
a) leaf b) seed c) stem d) bark



- 11) Stem borer is chemically controlled by spraying _____ endrin.
a) 20% b) 30% c) 50% d) 90%
- 12) Pod borer is chemically controlled by spraying malathion
a) 10% b) 5% c) 6% d) None of the above
- 13) Classification of insecticides is based on _____ nature.
a) physical b) biological c) chemical d) cultural
- 14) _____ eugenol chemical is used for attracting the specific pests.
a) Butyl b) Acetyl c) Copper d) Methyl

2. Answer **any seven** of the following : **(7×2=14)**

- i) Define insect pest.
- ii) Give the two characters of mouth part.
- iii) What is damage ?
- iv) Write the scientific name of jowar and sugarcane.
- v) Define pulse beetle.
- vi) What are carbamets ?
- vii) Define dusts.
- viii) What is management ?
- ix) Define pheromones.

3. A) Answer **any two** of the following : **(2×5=10)**

- i) Explain the attractant studied by you.
- ii) Describe the plant origin insecticides.
- iii) Write a note on principle of insect pest control.

B) Explain the host range and control of thrips. **4**

4. Answer **any two** of the followings : **(2×7=14)**

- i) Explain the tomato-red spider studied by you.
- ii) Describe the losses caused by insect pests.
- iii) Give the general characters of typical insect with respect to wings and abdomen.

5. Answer **any two** of the followings : **(2×7=14)**

- i) Describe the classification of insect pests based on metamorphosis.
 - ii) Explain the brinjal-fruit borer studied by you.
 - iii) Write on precautionary measures used during pesticide applications.
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B.Sc. – II (Semester – IV) (CGPA) Examination, 2017
METEOROLOGY (Paper – III)
Applied Climatology

Time : 2 $\frac{1}{2}$ Hours

Max. Marks : 70

- Note :** 1) **All questions are compulsory.**
2) **Figures to the right indicate full marks.**
3) **Draw neat diagrams wherever necessary.**
4) **Use of stencils is allowed.**

1. Choose the correct alternative :

14

- 1) Thick fog along the coast of New Found land is due to _____
(Warm and cold currents, Cold and cold currents, Iceberg, Warm current)
- 2) The weight of the atmosphere above the height of an observer indicates atmospheric _____
(Pressure, Humidity, Isostasy, Temperature)
- 3) The primary purpose of clothing is to protect man against _____
and improve his physical comfort.
(Temperature, Humidity, Winds, Weather)
- 4) The centrifugal force is operating only when the air moves in a _____
path.
(Parallel, Curved, Vertical, Horizontal)
- 5) The body comfort zone ranges between 18.9° _____ ° Celsius.
(22.4, 23.9, 25.6, 27.4)
- 6) Runways have the best location along the _____ winds.
(Prevailing, Local, Cyclonic, Seasonal)
- 7) The heat islands are mostly located at the _____ of an urban centre.
(Heart, Margins, Outside, Fringe)



8) _____ transport has most complex relationship with atmosphere.

(Aviation, Rails, Road, Ships)

9) As per world meteorological observations there should be one _____ center at each 180 Km interval.

(Primary, Secondary, Tertiary, Quaternary)

10) Satellites help in _____ forecasting.

(Weather, Climate, Paleoclimate, Projected climate)

11) Hot and humid climate of _____ region is worse for human settlements.

(Equatorial, Monsoonal, Polar, Alpine)

12) Bombay high is a _____ production centre.

(Petroleum, Natural gas, Petroleum natural gas, Crude oil)

13) The summer isotherms of the northern hemisphere generally show a trend towards _____

(North pole, South pole, Equator, Parallel to equator)

14) Numerical method of weather forecasting was first suggested by _____ in 1912.

(Chrichfield, Robinson, Richardson, Bjerknes)

2. Write in short (**any 5**) :

15

1) Define applied climatology.

2) What is an isobar ?

3) What is body comfort ?

4) What are the green buffers zones ?

5) What is air pollution ?

6) What is 'off shore' ?



3. Answer **any three** questions : **15**
- 1) State the effects of carioles force.
 - 2) What is costal fishing ?
 - 3) Explain the Body Comfort zone.
 - 4) Describe the concept 'Agro Climate'.
4. Write in short (**any 3**) : **15**
- 1) Explain the Heat Islands.
 - 2) Explain the interrelations between telecommunications and air.
 - 3) Describe the historical background of weather forecasting.
 - 4) Describe the importance of pressure gradient.
5. A) Write **any one** answer : **6**
- 1) Explain the importance of climate in transportation.
 - 2) Describe the effects of climate on agriculture.
- B) Write **any one** brief answer : **5**
- 1) Write the effects of urban climate on 'Body Comfort'.
 - 2) State the elements of weather and explain any one of them.
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B.Sc. – II (Semester – IV) (CGPA) Examination, 2017
GEOCHEMISTRY
Principles of Geochemistry (Paper – III)

Time : 2½ Hours

Max.Marks : 70

- Instructions:** 1) **All** questions are **compulsory**.
2) Figures to the **right** indicate **full** marks.
3) Draw **neat** diagrams **wherever** necessary.

1. Choose the most correct alternative each of the following : 14
- 1) The law of mass action is applicable for _____ reaction.
 - a) Irreversible
 - b) Reversible
 - c) Fast
 - d) None of these
 - 2) According to Bronsted theory, acid is _____ donar.
 - a) Electron
 - b) Neutron
 - c) Proton
 - d) Particle
 - 3) The formation of petroleum is from _____ rock.
 - a) Sedimentary rock
 - b) Basalt
 - c) Metamorphic rock
 - d) Igneous
 - 4) Dispersion of liquid in liquid is called as
 - a) sol
 - b) gel
 - c) emulsion
 - d) colloidal solution
 - 5) When equilibrium constant is one. Then
 - a) $R_f > R_b$
 - b) $R_f < R_b$
 - c) $R_f = R_b$
 - d) None of these
 - 6) The basic rock contains high % of
 - a) FeO
 - b) NaO
 - c) CaO
 - d) MgO



- v) Define equilibrium constant.
 - vi) Define hydrolysis.
 - vii) Define functional group.
 - viii) Draw the structure of Olivine.
 - ix) Write the names of a) CH_3OH b) C_2H_2 .
3. A) Answer **any two** of the following : **10**
- i) Show that chemical equilibrium is dynamic in nature for the reaction $\text{A} + \text{B} = \text{C} + \text{D}$.
 - ii) How the concentration of $(\text{HCO}_3)^-$ is estimated from hydrolysis of Na_2CO_3 ?
 - iii) Discuss the occurrence of carbon in rock.
- B) Discuss Tyndall effect. **4**
4. Answer **any two** of the following : **14**
- i) State and explain Lechatelier's principle.
 - ii) Discuss the geological uses of acids and bases.
 - iii) Write a short note on origin of coal.
5. Answer **any two** of the following : **14**
- i) Write a short note on origin of charge on colloidal particle.
 - ii) Distinguish between reversible and irreversible process.
 - iii) Discuss the origin of petroleum.
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B.Sc. (Part – II) (Semester – IV) (CGPA) Examination, 2017
ZOOLOGY (Paper – V)
Animal Diversity – IV

Time : 2.30 Hours

Max. Marks : 70

- N.B. :** 1) **All questions are compulsory.**
2) **Figures to the right indicate full marks.**
3) **Draw neat and labelled diagrams wherever necessary.**

1. Select the appropriate answer and rewrite the sentences. **14**
- 1) In case of _____ endoskeleton is pneumatic.
a) amphibians b) aves c) reptiles d) mammals
 - 2) In rat digestion takes place in stomach is called as _____ digestion.
a) duodenal b) gastric c) intestinal d) rectal
 - 3) The liver of rat secretes _____
a) Bile b) Pancreatic juice
c) HCl d) Enzymes
 - 4) The pulmonary vein carry _____ blood to the heart.
a) Deoxygenated b) Impure c) Oxygenated d) Mixed
 - 5) In Poisonous snakes teeth are termed as _____
a) Fangs b) Canines c) Molars d) Diastema
 - 6) Dentition in human is _____
a) Monophyodont b) Acrodont c) Polyphyodont d) Diphyodont
 - 7) Latitudinal migration of birds is from _____ and vice-versa.
a) North to South b) East to West c) Top to Bottom d) West to South
 - 8) Among the mesozoic reptiles the body of _____ was fish like.
a) Brontosaurus b) Stegosaurus c) Ichthyosaurus d) Appatosaurus



- 9) Wood chiselling beak is found in _____
a) Wood pecker b) King fisher c) Duck d) Owl
- 10) Monotreme includes _____ mammals.
a) Viviparous b) Egg laying c) Pouched d) Modern
- 11) WBCs of rat are also known as _____
a) thrombocytes b) erythrocytes c) blood platelets d) leucocytes
- 12) In Heron _____ types of feet are present.
a) perching b) swimming c) raptorial d) wadding
- 13) In birds the body is covered with _____
a) feathers b) scales c) hair d) scutes
- 14) The brain of vertebrates shows presence of hollow spaces known as _____
a) ventricles b) sinuses c) ampullae d) nodes

2. Answer **any seven** of the following.

14

- i) Salient features of Aves
- ii) RBCs of rat
- iii) Seed eating beak
- iv) Ovary in rat
- v) Any one terrestrial mesozoic reptile
- vi) Archaeopteryx
- vii) Beak in Parrot
- viii) Functions of kidney in rat
- ix) Systematic position of rat.

3. A) Answer **any two** of the following.

10

- i) Enlist different types of migration in birds
- ii) Describe dentition in mammals
- iii) Explain in brief the monotremes



3. B) Describe the functions of liver of rat. 4
4. Answer **any two** of the following . 14
- i) Describe the brain of rat.
 - ii) Describe the poison apparatus of snake.
 - iii) Describe the different types of leg modifications found in birds.
5. Answer **any two** of the following. 14
- i) Describe respiratory system of rat.
 - ii) Describe aerial adaptations in birds.
 - iii) Describe the ear of rat as a sense organ.
-



Seat No.	
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B.Sc. – II (Semester – IV) (CGPA) Examination, 2017
METEOROLOGY (Paper – IV)
Meteorological Instruments

Time : 2.30 Hours

Max. Marks : 70

- Instructions** : 1) **All questions are compulsory.**
2) **Figures to the right indicate full marks.**
3) **Neat diagrams must be drawn wherever necessary.**
4) **Use of scientific calculator and log table is allowed.**

1. Choose and write a correct answer from given alternatives : 14

- i) The float gauge is used to measure _____
a) Temperature b) Pressure c) Humidity d) Rainfall
- ii) Which of the following instrument automatically records the quantity measured ?
a) Thermometer b) Barometer
c) Hygrometer d) The automatic siphon gauge
- iii) Boiling point of pure water at sea level is _____
a) 100°R b) 100°C c) 100°F d) 100K
- iv) A temperature of 0°C is equal to _____ °F.
a) 0 b) 32 c) 80 d) 273
- v) At what temperature do the Celsius and the Fahrenheit scales coincide ?
a) 0° b) –40° c) –80° d) –273°
- vi) Celsius and _____ scales show the same reading at minus 40 degrees.
a) Fahrenheit b) Reaumur c) Kelvin d) Rankin
- vii) C.G.S. unit of pressure is _____
a) N/m b) N/m² c) dynes/cm² d) dynes/cm

P.T.O.



- viii) The lines of constant _____ are called isobars.
a) Pressure b) Temperature c) Entropy d) Humidity
- ix) Air in motion is known as _____
a) Spinning b) Wind c) Rotation d) Revolution
- x) _____ is a flowing wave of air, moving hither and thither indefinitely.
a) Sunshine b) Wind c) Radiation d) Coriolis force
- xi) The isotach is line of equal _____
a) Entropy b) Temperature c) Wind direction d) Wind speed
- xii) Wind results from _____ heating of different parts of the earth.
a) Over b) Even c) Equal d) Uneven
- xiii) _____ is the measure of amount of water vapors present in the atmosphere.
a) Temperature b) Pressure c) Humidity d) Radiation
- xiv) Thermocouple is based on the principle of _____ generated due to difference of temperature between two metal junctions.
a) resistance b) heat c) e.m.f. d) none of the above

2. Solve **any seven** of the following :

14

- i) Distinguish between ordinary rain gauge and self recording rain gauge.
- ii) Establish the relation between Celsius and Fahrenheit scales of temperature.
- iii) Why mercury is used in thermometer ?
- iv) How atmospheric pressure is measured using Fortin's barometer ?
- v) How a barograph is set for automatic recording of atmospheric pressure ?
- vi) What is wind vane ?
- vii) How wind velocity is measured using cup anemometer ?
- viii) Define absolute humidity.
- ix) What is a hygrometer ?



3. A) Attempt **any two** of the following : **10**
- i) With neat diagram explain construction and working of float gauge.
 - ii) Draw neat labeled diagram of aneroid barometer. Describe its construction and working.
 - iii) Explain construction and working of dry and wet bulb thermometer.
- B) Two unknown wind velocities 40 km/hr and 60 km/hr are measured using a cup anemometer and the respective linear velocities of rotating cups are 25m/s and 40 m/s. Determine constants of the cup anemometer. **4**
4. Attempt **any two** of the following : **14**
- i) With neat diagram explain construction and working of minimum and maximum thermometer.
 - ii) Draw neat labeled diagram of mercury barometer. Describe its construction and working.
 - iii) Explain Seebeck effect.
5. Attempt **any two** of the following : **14**
- i) With neat diagram explain the construction and working of automatic siphon gauge.
 - ii) With neat diagram explain anemograph.
 - iii) Write a note on Ether thermoscope.
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B.Sc. – II (Semester – IV) (CGPA) Examination, 2017
GEOCHEMISTRY
Chemistry of the Earth (Paper – IV)

Time : 2½ Hours

Max. Marks : 70

- Instructions:** 1) **All questions are compulsory.**
2) Figures to the **right** indicate **full** marks.
3) Draw **neat** labelled diagrams **wherever** necessary.
4) Answer to **both** Sections should be written in **same** answer book.

1. Fill in the blanks with correct answer from given options.

14

- 1) The reaction of H_2O with mineral is _____.
a) Hydrolysis b) Hydration c) Carbonation d) Oxidation
- 2) The major source of air pollution is _____.
a) Transportation b) Industrial processes
c) Solid waste d) Liquid waste
- 3) The most common mineral in the soil is _____.
a) Quartz b) Clay c) Calcite d) Felspar
- 4) The size of clay minerals is less than _____ mm.
a) 0.002 b) 0.02 c) 0.0002 d) 0.00002
- 5) The most susceptible mineral to chemical weathering is _____.
a) Muscovite b) Topaz c) Olivine d) Quartz
- 6) _____ soil horizon consists of partially altered and partially unaltered parent rock.
a) A b) B c) C d) R
- 7) If pH of the soil is 5 then the soil is said to be _____.
a) Neutral b) Alkaline c) Basic d) Acidic
- 8) _____ is responsible for green house effect.
a) $NO_2 + H_2O$ b) $SO_2 + H_2O$ c) $CO_2 + H_2O$ d) $Ar + H_2O$

P.T.O.



- 9) Mantle is mainly made up of _____ silicates.
 a) Mg-Fe b) Ni-Fe c) Mn-Fe d) Na-Fe
- 10) Soil, whose dimensions are between _____ mm is silty soil.
 a) 2 and 0.2 b) 0.2 and 0.02 c) 0.02 and 0.002 d) < 0.002
- 11) The process involving loss of electrons is
 a) Oxidation b) Reduction c) Potential d) Redundant
- 12) The composition of soil is
 a) Solids b) Organisms c) Air d) All of these
- 13) The most soluble atmospheric gas in water is
 a) NO₂ b) SO₂ c) Ar d) CO₂
- 14) Shape of clay particle is
 a) Rounded b) Tabular c) Scaly d) Angular
2. Answer **any seven** of the following : **14**
 i) What is mollisol soil ?
 ii) Define pollution.
 iii) Name the water pollutants.
 iv) Susceptibility sequence of minerals to chemical weathering.
 v) What is hydrogen ion concentration in pure water at 25° C ?
 vi) What is gravitational differentiation ?
 vii) How illite clays are formed ?
 viii) What is pedalfer soil ?
 ix) Explain roll of particulate matter in air pollution.
3. A) Write short notes on **any two** of the following : **10**
 i) Explain oxidation/reduction potential.
 ii) Describe carbonation and hydration processes.
 iii) Describe Eh and pH diagram.
- B) What are factors controlling soil formation ? **4**
4. Answer **any two** of the following : **14**
 i) Explain porosity of soil.
 ii) Describe soil horizon.
 iii) Explain Kaolinite structure with diagram.
5. Answer **any two** of the following : **14**
 i) Explain geochemical cycle.
 ii) Describe the process of formation of clay minerals.
 iii) Explain soil pollution.
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B.Sc. II (Semester – IV) (CGPA Pattern) Examination, 2017
ZOOLOGY
Histology and Physiology (Paper – VI)

Time : 2.30 Hours

Total Marks : 70

- N.B. :** 1) **All questions are compulsory.**
2) **Figures to the right indicate full marks.**
3) **Draw neat labelled diagram wherever necessary.**

1. Complete the sentence, selecting appropriate answer : **14**
- 1) The outer most the hardest covering of tooth is ____
a) enamel b) dentine c) cementum d) gum
 - 2) _____ tissue functions for the protection of body.
a) bone b) cartilage c) squamous d) nervous
 - 3) The area between two lines is known as sarcometer
a) A b) I c) Z d) D
 - 4) Graafian follicle secrete the hormone
a) estrogen b) oxytocin
c) progesterone d) vasopressin
 - 5) Malphigian body is situated in _____ part of kidney.
a) cortex b) both cortex and medulla
c) medulla d) loop of Hanle
 - 6) Glisson capsule is observed in
a) bone b) kidney c) liver d) testes
 - 7) Hormones oxytocin is secreted by
a) Neurohypophysis b) Graafian follicle
c) Corpus luteum d) Adenohypophysis
 - 8) Acromegaly is a effect of
a) hyposecretion of G.H b) hypersecretion of G.H
c) hypersecretion of STH d) hyposecretion of ACTH

P.T.O.



- 9) Sensitized T. cell are known as
- | | |
|--------------------|---------------------|
| a) B-cells | b) Macrophages |
| c) Killer T. cells | d) α - cells |
- 10) _____ cell immunity as humeral immunity.
- | | | | |
|------|------|------|------|
| a) B | b) T | c) A | d) D |
|------|------|------|------|
- 11) Hormone progesterone is secreted by
- | | |
|-----------------------|----------------------|
| a) Corpus luteum | b) Graafian follicle |
| c) Interstitial cells | d) Leydig's cells |
- 12) The endocrine part of testes is called as
- | | |
|-------------------------|------------------|
| a) interstitial cells | b) corpus luteum |
| c) islets of langerhans | d) choroidplexus |
- 13) Normally full term pregnancy is lasts for _____ days.
- | | | | |
|--------|--------|--------|--------|
| a) 130 | b) 140 | c) 200 | d) 280 |
|--------|--------|--------|--------|
- 14) Copper-T- is
- | | |
|----------------------|------------------|
| a) IUD | b) Stomic device |
| c) Intestinal device | d) Oral device |

2. Answer **any seven** of the following :

14

- i) Loop of Henle.
- ii) Draw neat labelled diagram of liver.
- iii) Non-Striated muscle fiber.
- iv) Androgens.
- v) Pitocin.
- vi) Podocytes.
- vii) Kupffer cells.
- viii) Enamel.
- ix) Amniocentesis.



3. A) Attempt **any two** of the following : **10**
- i) Describe the V.S. of mammalian tooth.
 - ii) Describe the T.S. of uterus.
 - iii) Describe the hormonal control of pregnancy.
- B) Describe the oral pills as contraceptives. **4**
4. Attempt **any two** of the following : **14**
- i) With suitable diagram describe the structure and functions of striated muscle.
 - ii) Describe the histology of mammalian testis.
 - iii) Describe the menstrual cycle in mammals.
5. Attempt **any two** of the following : **14**
- i) What is immunology ? Describe the humoral immunity and its mechanism.
 - ii) Give an account of hormones secreted by the anterior part of pituitary gland.
 - iii) Describe the invitro fertilization.
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**B.Sc. (Part – II) (Semester – IV) Examination, 2017
BOTANY**

Paper – V : Plant Physiology and Cytogenetics (CGPA Pattern)

Time : 2½ Hours

Total Marks : 70

- Instructions :** 1) **All questions carry equal marks.**
2) **Question 1 is compulsory.**
3) **Draw neat and labeled diagrams wherever necessary.**
4) **Figure to the right indicate full marks.**

1. Rewrite the following sentences, choosing the correct answer : 14

- 1) The transfer of organic substances from cytoplasm to cytoplasm of another cell through plasmodesmata is called _____
 - a) Apoplast
 - b) Symplast
 - c) Leucoplast
 - d) Amyloplast
- 2) C₄ Cycle is known as _____
 - a) Calvin Cycle
 - b) HSK Pathway
 - c) CAM Pathway
 - d) None of these
- 3) _____ is an example of symbiotic nitrogen fixing bacterium.
 - a) Rhizobium
 - b) Clostridium
 - c) Aerobacter
 - d) Azotobacter
- 4) _____ algae is present in cycas corrolloid root.
 - a) Nostoc
 - b) Spirogyra
 - c) Oedogonium
 - d) Both 'a' and 'b'
- 5) _____ is an example of CAM plant.
 - a) Opuntia
 - b) Jawar
 - c) Rice
 - d) Rose
- 6) The atmosphere contains _____ percent nitrogen.
 - a) 0.03%
 - b) 78%
 - c) 79%
 - d) 70%
- 7) The chromosome bear genetic material in the form of _____
 - a) DNA
 - b) Histone-1
 - c) Histone-2a
 - d) Histone-4



- 8) In the process of meiosis chromosome number in the cell is _____
- a) Reduced to half b) Remains constant
c) Get doubled d) None of these
- 9) The Meiosis is divided into _____
- a) 1-phase b) 2-phases
c) 3-phases d) 4-phases
- 10) The chromosome theory of heredity is given by _____
- a) Walter and Sutton b) Sutton and Bateson
c) T. Boveri and Mendel d) Sutton and Mendel
- 11) The crossing over is _____
- a) Same as translocation
b) Directly proportional to linkage
c) Inversely related to linkage
d) None of these
- 12) The number of chiasmata depend on _____ of chromosomes.
- a) Length b) Width
c) Breadth d) None of these
- 13) The quatasomes are present in _____
- a) Cristae b) Stroma
c) Granum d) None of these
- 14) During photosynthesis _____ gas enters through stomata of leaf.
- a) O₂ b) CO₂ c) N₂ d) CO

2. Attempt **any seven** of the following questions.

14

- 1) What is the role of heterosyst in BGA Nostoc ?
- 2) Define photosynthesis.
- 3) What is apoplastic transport ?
- 4) What is the role of Xanthophyll pigment ?
- 5) Describe 'V' shaped chromosome.
- 6) Describe the events that are taking place in Meiosis anaphase – I.
- 7) What is Hill reaction ?
- 8) What is significance of crossing over ?



3. A) Attempt **any two** of the following questions : 10
- 1) Comment up on chloroplast dimorphism.
 - 2) Explain nitrogen cycle.
 - 3) Explain incomplete linkage.
- B) Describe the types of chromosomes. 4
4. Answer **any two** of the following questions. 14
- 1) Explain the noncyclic photophosphorylation.
 - 2) Explain the mechanism of biological nitrogen fixation.
 - 3) Define linkage and comment up on its significance.
5. Answer **any two** of the following questions. 14
- 1) Explain the CAM pathway of photosynthesis.
 - 2) Comment up on Meiosis-I.
 - 3) What is crossing over ? Explain the mechanism of crossing over.
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B.Sc. (Part – II) (Semester – IV) Examination, 2017
BOTANY (Paper – VI) (CGPA)
Utilization of Plant

Time : 2½ Hours

Max. Marks : 70

- Instructions :** I) **All questions are compulsory.**
II) Draw a **neat** labelled diagram **wherever** necessary.
III) Figures to the **right** indicate **full** marks.
IV) **All questions carry equal** marks.

1. Rewrite the correct answer from the given alternatives : (1×14=14)
- 1) *Cicer arietinum* is the botanical name of
 - a) harbhara
 - b) tur
 - c) vilayati gavat
 - d) shevari
 - 2) *Gossypium arboreum* plant has origin from
 - a) Myanmar
 - b) India
 - c) Australia
 - d) Keniya
 - 3) The botanical name of Soyabean is
 - a) *Cajanus cajan*
 - b) *Indigo tinctoria*
 - c) *Glycine max*
 - d) *Medicago sativa*
 - 4) In *Zingiber officinales* drug is obtained from
 - a) root
 - b) bark
 - c) seed
 - d) rhizome
 - 5) *Hevea brasiliensis* plant grows upto _____ feet.
 - a) 60 – 160
 - b) 60 – 130
 - c) 60 – 120
 - d) 60 – 150
 - 6) The example of botanical pesticide is
 - a) neem
 - b) mango
 - c) tur
 - d) jowar
 - 7) The dyes Kutch belongs to the family
 - a) Mimosaceae
 - b) Verbenaceae
 - c) Rubiaceae
 - d) Fagaceae



- 8) Indian vernacular name of Log wood is
a) Khair b) Patang c) Palas d) Henna
- 9) *Celosia* is an example of _____ plant.
a) Oil yielding b) Fibre yielding
c) Ornamental d) Dye yielding
- 10) *Crossandra* is _____ plant.
a) Seasonal b) Biennial
c) Perennial d) Climber
- 11) *Aloe barbadense* is a native of _____ Indies.
a) West b) South
c) North d) East
- 12) _____ is an example of Cosmetic and Perfumes.
a) Neem b) Tobacco
c) Custard d) Rose
- 13) *Quisqualis indica* plant is
a) Seasonal b) Perennial
c) Cactus d) Prostrate
- 14) Shevari is an example of _____ legume.
a) Food b) Fodder c) Fibre d) Oil

2. Answer **any seven** of the following :

(7×2=14)

- i) What is legume ?
- ii) Define plant fibres.
- iii) Give the botanical name of groundnut and soyabean.
- iv) Write three uses of *Syzygium aromaticum*.
- v) Define pesticides.
- vi) What is plant dyes ?
- vii) Give the uses of turmeric.
- viii) Define seasonal plant.
- ix) Write the sources of *Citronella* and Jasmine.



3. A) Answer **any two** of the following : **(2×5=10)**
- i) Explain the *Chrysanthemum* ornamental plant studied by you.
 - ii) Write the cultural practice of groundnut.
 - iii) Describe the origin, morphology and uses of cotton.
- B) Explain the plant dyes *Indigo* and Heena studied by you. **4**
4. Answer **any two** of the following : **(2×7=14)**
- i) Describe the plant perfumes and cosmetics plant *Aloe* studied by you.
 - ii) Explain the red gram food legume.
 - iii) Write the *Emblical officinales* medicinal plants studied by you.
5. Answer **any two** of the following : **(2×7=14)**
- i) Explain the physical and chemical properties of rubber.
 - ii) Describe the custard apple as botanical pesticides studied by you.
 - iii) Write an essay on *Bougainvillea* and *Quesqualis* plants.
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Seat No.	
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B.Sc. (Part – II) (Semester – IV) (CGPA) Examination, 2017
PSYCHOLOGY
Cognitive Psychology (Paper – V)

Time : 2.30 Hours

Max. Marks : 70

Instructions : 1) **All questions are compulsory.**
2) **Figures to the right indicate full marks.**

1. Choose and write a correct answer of the following **four** alternatives : **14**
- 1) _____ is the internal interpretation of stored information.
A) Health B) Cognition C) Self D) Stress
 - 2) The scientific study of mental activity with the establishment of the first modern psychology laboratory in _____
A) 1879 B) 1832 C) 1920 D) 1932
 - 3) _____ was focused on understanding the nature of consciousness.
A) Wundt B) Titchener
C) Rene D) Akron
 - 4) _____ guiding idea was that the contents of consciousness.
A) Maslow B) Wundt
C) Skinner D) Adler
 - 5) The scientific psychology was developed primarily in _____
A) William James B) Wundt
C) Darwin D) Grafen
 - 6) Today the study of _____ activity is again respectable.
A) Mental B) Social
C) Objective D) Happiness



- 3) Where was first psychological laboratory ?
- 4) Who formulated alternative theories ?
- 5) Which theories are limited by facts about the brain ?
- 6) Define cognition.
- 7) Which method measures directly observable behavior ?
- 8) How many methods we can evaluate the correlation ?
- 9) Full form of MRI.
- 10) Who won the 2003 Nobel Prize in Physiology for their roles in developing MRI ?

3. Short notes (**any two** out of four) : **14**

- 1) The contents of consciousness.
- 2) The cognitive revolution.
- 3) Mental representation.
- 4) Top-Down and Bottom-Up Processing.

4. Answer the following (**any one**) : **14**

- 1) Explain the Feature-Matching Models.

OR

- 2) Explain the Correlational Neural Methods.

5. Describe the context effects for feature and group processing. **14**



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B.Sc. – II (Semester – IV) (CGPA Pattern) Examination, 2017
GEOLOGY (Paper – V)
Igneous Petrology

Time : 2¹/₂ Hours

Max. Marks : 70

- Instructions :** 1) **All questions are compulsory.**
2) Draw **neat** diagrams **wherever** necessary.
3) Figure to the **right** indicate **full** marks.
4) Write **both** the Sections in **same** answersheet.

1. Write a correct answer from the given four alternatives.

14

- 1) Diorite rock is a _____ rock.
 - a) Basic
 - b) Acidic
 - c) Intermediate
 - d) Ultrabasic
- 2) _____ occurs as an essential mineral only in basic and ultrabasic rocks.
 - a) Augite
 - b) Olivine
 - c) Quartz
 - d) Biotite
- 3) When a rock is made up entirely of crystals, its texture is described as _____
 - a) holocrystalline
 - b) holohyaline
 - c) merocrystalline
 - d) none of these
- 4) Acid rocks are also called as _____ rocks.
 - a) mafic
 - b) felsic
 - c) ultramafic
 - d) none of these
- 5) Granite rock is a _____ rock.
 - a) Basic
 - b) Acidic
 - c) Intermediate
 - d) Ultrabasic
- 6) If the grains of igneous rock show, well developed crystal faces, then it is called as _____
 - a) anhedral
 - b) euhedral
 - c) subhedral
 - d) none of these



3. A) Write short note on **any two** of the following : **10**
- 1) Explain porphyritic texture.
 - 2) Explain intergrowth texture.
 - 3) Explain orbicular microstructure.
- B) Explain xenolith structures. **4**
4. Attempt **any two** of the following : **14**
- 1) Explain differentiation process by liquid immiscibility.
 - 2) Classification of igneous rocks based on mode of occurrence and mineralogy.
 - 3) Explain crystallisation of binary magma.
5. Attempt **any two** of the following : **14**
- 1) Explain crystallisation process of unicomponent magma.
 - 2) Explain reaction relationships in magma.
 - 3) Explain formation of glass and crystals.
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B.Sc. – II (Semester – IV) (CGPA) Examination, 2017
MICROBIOLOGY
Immunology and Medical Microbiology (Paper – V)

Time : 2½ Hours

Max. Marks : 70

N.B. : 1) ***All questions are compulsory.***
2) ***Figures to the right indicates full mark.***

1. Rewrite the following sentences by selecting correct answers from given alternatives :

14

- 1) Widal Test is the best example of _____
 - a) Precipitation
 - b) Agglutination
 - c) Neutralization
 - d) Haemagglutination
- 2) Coagulase contributes to virulence of _____ organism.
 - a) E. coli
 - b) S. aureus
 - c) S. typhi
 - d) S. dysenteriae
- 3) _____ is major antibody produced in primary immune response.
 - a) IgM
 - b) IgG
 - c) IgA
 - d) IgD
- 4) Tears contains _____ as an antibacterial agent.
 - a) Properdin
 - b) Complement
 - c) Interferon
 - d) Lysozyme
- 5) Chemically antibodies are _____
 - a) Lipids
 - b) Carbohydrates
 - c) Proteins
 - d) Phospholipids
- 6) _____ is clinical specimen for tuberculosis.
 - a) Blood
 - b) Urine
 - c) Pus
 - d) Sputum

P.T.O.



- 5) Define autoantigens.
 - 6) What is function of Natural Killer Cell ?
 - 7) What is phagocytosis ?
 - 8) Define vaccines.
 - 9) What is serum ?
3. A) Attempt **any two** of the following : **10**
- 1) Active immunity.
 - 2) Microscopic examination of clinical specimen.
 - 3) Mechanism of bacterial invasion.
- B) With diagram describe basic structure of antibody. **4**
4. Attempt **any two** of the following : **14**
- 1) Describe the first line of defense mechanism.
 - 2) Discuss the types and factors affecting antigenicity.
 - 3) Describe with example agglutination reactions.
5. Attempt **any two** of the following : **14**
- 1) Describe the urinary tract infections.
 - 2) Describe in detail immune response.
 - 3) Discuss the biochemical methods of diagnosis of diseases.
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B.Sc. (Part – II) (Semester – IV) (CGPA) Examination, 2017
PSYCHOLOGY
Positive Psychology (Paper – VI)

Time : 2.30 Hours

Max. Marks : 70

Instructions : 1) **All questions are compulsory.**
2) **Figures to the right indicate full marks.**

1. Choose and write a correct answer of the following four alternatives. 14
- 1) _____ description of the three pillars of positive psychology.
A) Seligman's B) Park's C) Rashid D) Singer
 - 2) A _____ life is focused on going beyond our own self-interest and preoccupations.
A) meaningful B) cultural C) engage D) pleasant
 - 3) The concept of post traumatic growth as a counterpoint to post traumatic _____ disorder.
A) stress B) anxiety C) depression D) personality
 - 4) _____ is a central component of people's conception of a good life and good society.
A) Mood B) Subjective C) Objective D) Happiness
 - 5) Ryff and Keyes described _____ aspects of positive functioning.
A) 2 B) 4 C) 6 D) 8
 - 6) Fredrickson developed broaden and build theory of positive _____.
A) emotion B) motivation C) IQ D) health
 - 7) _____ focused coping involves behaviors directed at altering the source of stress.
A) Problem B) Emotion C) Proactive D) Active
 - 8) Aspinwall and _____ suggested proactive coping.
A) Taylor B) Fredrickson C) Tellegen D) Salovey
 - 9) Positive reappraisal refers to a _____ strategy.
A) social B) emotion C) cognitive D) motivation
 - 10) Two dimensional representation of _____ goals.
A) 10 B) 11 C) 12 D) 13



- 11) _____ motives involve negative emotions.
 A) Internal B) External C) Identified D) Interjected
- 12) Emmons's research on _____ striving.
 A) personal B) social C) economical D) mental
- 13) Grouzet suggested the content of human goals across _____ cultures.
 A) 10 B) 11 C) 14 D) 15
- 14) _____ motives refer to the rewards approval praise or situational demands.
 A) Internal B) External C) Identified D) Interjected

2. Answer the following (**any seven**) : **14**
- 1) Define subjective well-being.
 - 2) Meaning of the pleasant life.
 - 3) Meaning of hedonic happiness.
 - 4) Define positive affect.
 - 5) Define positive emotion.
 - 6) Meaning of ordinary magic.
 - 7) Define positive psychology.
 - 8) What is happiness ?
 - 9) Meaning of interjected motives.
3. A) Write the short note (**any two**) : **10**
- 1) Life tasks.
 - 2) Clinical perspectives of resilience.
 - 3) What are the positive emotions ?
- B) Health psychology. **4**
4. Answer the following **any two** : **14**
- 1) Describe the psychology of well-being.
 - 2) Explain the psychological resources.
 - 3) Explain the measuring personal goals.
5. Answer the following **any two** : **14**
- 1) Discuss on happiness and success in college.
 - 2) Explain the physical resources.
 - 3) Describe two tradition of happiness.
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Seat No.	
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B.Sc. – II (Semester – IV) Examination, 2017
GEOLOGY (Paper – VI) (CGPA)
Sedimentary and Metamorphic Petrology

Time : 2.30 Hours

Max. Marks : 70

- Instructions :** 1) **All questions are compulsory.**
2) **Figures to the right indicate full marks.**
3) **Draw neat labelled diagrams wherever necessary.**
4) **Answer to both sections should be written in separate answer book.**

1. Choose and write correct answer from given alternatives. **14**
- 1) The concentric coating of calcium carbonate can be seen in
a) limestone
b) fossiliferous limestone
c) oolitic limestone
d) dolomite
- 2) Composition of dolomite is
a) CaCO_3
b) MgCO_3
c) $\text{CaCO}_3 \text{MgCO}_3$
d) none of these
- 3) Which of the following shows non-foliated fabric ?
a) Marble b) Schist c) Gneiss d) None of these
- 4) The sedimentary rock with rounded to sub-rounded pebbles is called
a) breccia b) conglomerate c) shale d) limestone
- 5) The rock formed by a process of pulverization and rolling of minerals from pre-existing rocks by cataclastic metamorphism is called as
a) mylonite b) duricrust c) migmatite d) charnockite
- 6) Omphacite is representative mineral of _____ facies.
a) zeolite b) greenschist c) eclogite d) amphibolite

P.T.O.



3. A) Attempt **any two** of the following. **10**
- i) Describe different processes involved in sedimentary rock formation.
 - ii) Explain textural characters of sediments.
 - iii) Write notes on mylonite and gneiss.
- B) Define rudaceous rocks. Add a note on its varieties. **4**
4. Attempt **any two** of the following. **14**
- i) Define sedimentary rocks. Describe in detail calcareous sedimentary rocks.
 - ii) Explain in detail greenschist and granulite facies.
 - iii) Describe in detail different types of metamorphic fabric.
5. Attempt **any two** of the following. **14**
- i) Describe process of poly-metamorphism and retrograde metamorphism.
 - ii) Describe in detail characters of residual sedimentary deposits with reference to laterite and bauxite.
 - iii) What is sedimentary environment ? Add a note on transitional environment.
-



- viii) The optimum temperature for alcohol production is _____ °C.
a) 10 b) 28 c) 20 d) 5
- ix) _____ is an example of probiotic food.
a) Butter b) Buttermilk c) Milk powder d) Kefir
- x) High levels of _____ are required for cultivation of hydrogen utilising bacteria as SCP.
a) O₂ b) CO₂ c) NH₃ d) Trace elements
- xi) _____ are used for adequate mixing of medium and air.
a) Sparger b) Vacuum pump
c) Baffles d) Cooling coils
- xii) The strain improvement increases _____ of organism.
a) Production capacity b) Stability
c) Size d) Growth rate
- xiii) The freezing mixture used in lyophilisation contains alcohol and
a) Salt b) Sugar
c) Nitrogen d) Dry ice
- xiv) Penicillin is recovered by _____ method.
a) Distillation b) Solvent extraction
c) Centrifugation d) Flocculation

2. Answer **any seven** :

14

- i) What is industrial microbiology ?
- ii) Mention few examples of raw materials used in fermentation.
- iii) What is the objective of agitation ?
- iv) Describe in short surface culture method.
- v) Describe single stage recycle continuous fermentation.
- vi) What is soil culture ?
- vii) Define mode.
- viii) Mention the ways to control foam formation.
- ix) Define assay.



3. A) Answer **any two** : **10**
- i) Write on scope of industrial microbiology by listing the products.
 - ii) Give an account of primary screening.
 - iii) Write on probiotics.
- B) Give an account of dual fermentation. **4**
4. Answer **any two** : **14**
- i) Describe industrial production of alcohol.
 - ii) Describe strain improvement.
 - iii) Describe measures of central tendency. Write on applications of biostatistics.
5. Answer **any two** : **14**
- i) Describe preservation methods.
 - ii) Give an account of assay procedures.
 - iii) Write on SCP as fermentation product.
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Seat No.	
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B.Sc. – III (Semester – V) (New-CGPA) Examination, 2017
ENGLISH (Compulsory)
Breakthrough

Time : 2¹/₂ Hours

Max. Marks 70

N.B. : 1) **All questions are compulsory.**
2) **Figures to the right indicate full marks.**

1. A) Choose the correct alternative : 10

- 1) Which of the following statements about the Press is not true ?
 - a) The newspapers are owned by rich men
 - b) People get their opinions from the newspapers
 - c) The Press is free
 - d) Honest editors and journalists are replaced by subservient ones
- 2) According to G. B. Shaw, the _____ is a despoiler and oppressor of the poor.
 - a) Parson
 - b) Peasant
 - c) Journalist
 - d) Squire
- 3) The Gettysburg Address was delivered by Abraham Lincoln on _____.
 - a) 19 November 1863
 - b) 19 November 1683
 - c) 19 July 1863
 - d) 19 July 1683
- 4) Abraham Lincoln and other Americans gathered at Gettysburg battlefield to
 - a) To celebrate their victory in a civil war
 - b) To dedicate a cemetery for the soldiers who died there
 - c) To mourn the death of soldiers who died there
 - d) To thank American people for their support in the civil war
- 5) The flower mentioned in the poem “*Abou Ben Adhem*” is _____.
 - a) Rose
 - b) Lily
 - c) Jasmine
 - d) Lotus



- 4) What responsibility does Lincoln assign to the people assembled at the Gettysburg ?
- 5) What was the fate of the gifted woman in the 16th century ?
- 6) How does society erode the talents of women writers ?
- 7) What does G.B. Shaw say about the Religion ?
- 8) Why do Judith's parents keep her from nurturing her talent ?
- 9) What was the cause of the American civil war ?

3. A) Answer **any two** of the following : **8**

- 1) Give two examples of metaphors used in the poem *O Captain! My Captain!*.
- 2) What did Abou Ben Adhem see in his dream ?
- 3) What is the central idea of the poem *O Captain! My Captain!* ?

B) Write short reports on **any two** of the following : **6**

- 1) The inaugural function of Science Association of your college.
- 2) Farmers' suicides in Maharashtra.
- 3) Your visit to National Chemical Laboratory, Pune.

4. Answer **any one** of the following : **14**

- 1) Prepare a presentation consisting of five charts or slides to promote a "Roti Maker" in the market.
- 2) Write a presentation on the topic "Safety of Women" using charts, transparencies or slides.

5. Write a transcript of group discussion on the topic "Foreign Direct Investment (FDI) in retail – good or bad?". **14**



Seat No.	
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**B.Sc. – III (Semester – V) Examination, 2017
PHYSICS (Special Paper – VII) (New CGPA Pattern)
Mathematical Physics and Statistical Physics**

Time : 2 ½ Hours

Max. Marks : 70

- N.B. :** I) **All questions are compulsory.**
II) **Draw diagrams whenever necessary.**
III) **Figures to the right indicates full marks.**
IV) **Use of logtable or calculator is allowed.**

1. Select the correct alternative from following :

14

- i) The microstates which are allowed under given restriction are called _____
- a) Accessible microstates b) Allowed microstates
c) Disallowed microstates d) Permitted microstates
- ii) The entropy has its maximum value for thermodynamic assembly in _____ state.
- a) An inequilibrium b) An equilibrium
c) A normal d) Non homogeneous state
- iii) In orthogonal curvilinear co-ordinate system, the co-ordinate surfaces are in general _____
- a) Spherical b) Plane
c) Curved d) Cylindrical
- iv) The three co-ordinates of spherical polar co-ordinates system are _____
- a) (r, θ, z) b) (u_1, u_2, u_3)
c) (x, y, z) d) (r, θ, ϕ)

P.T.O.



- v) The highest of the orders of the differential coefficients occurring in a differential equation is called _____ of the differential equation.
- a) Order
b) Linearity
c) Degree
d) homogeneity
- vi) Maxwell Boltzmann law of distribution depend on following conditions, for a system _____
- a) Total volume of assembly is constant
b) Temperature of system is constant
c) Total entropy is constant
d) Total number of molecules and total energy of assembly is constant
- vii) The relation between v_{mp} , \bar{v} and v_{rms} of the gas molecules in a system is _____
- a) $v_{rms} < \bar{v} < v_{mp}$
b) $v_{rms} \leq \bar{v} \leq v_{mp}$
c) $v_{mp} < \bar{v} < v_{rms}$
d) $\bar{v} < v_{mp} < v_{rms}$
- viii) The energy distribution in the spectrum of black body radiation is _____
- a) Uniform
b) Non-uniform
c) Not continuous
d) Straight line
- ix) Photon obeys _____
- a) M.B. statistics
b) B.E. statistics
c) F.D. statistics
d) a) and c)
- x) Rayleigh-Jean's formula agrees well with the experimental results at _____ wavelengths.
- a) All
b) Shorter
c) Longer
d) Lesser
- xi) Energy of the highest filled quantum state is _____
- a) Electron energy
b) Free energy
c) Fermi energy
d) Zero point energy



xii) Fermi-Dirac distribution law is widely applied in the _____

- a) Band theory of solids
- b) Debye's theory of specific heat
- c) Free electron theory of metals
- d) Classical theory

xiii) According to Fermi Dirac statistics, the resulting electronic specific heat is approximately given by _____

- a) $\frac{3}{2} \left(\frac{KT}{U_F} \right) R$
- b) $\frac{3}{2} \left(\frac{KT}{R} \right) U_F$
- c) $\frac{3}{2} \left(\frac{U_F}{KT} \right) R$
- d) $\frac{3}{2} \left(\frac{K}{U_F} \right) R$

xiv) According to Gauss divergence theorem, $\iiint_V \text{div } \vec{F} \, dv =$ _____

- a) $\int \vec{F} \cdot \vec{n} \, ds$
- b) $\oint \vec{F} \cdot \vec{n} \, ds$
- c) $\iint_S \vec{F} \cdot \vec{n} \, ds$
- d) $\iint_S \vec{F} \times \vec{n} \, ds$

2. Answer **any seven** of the following :

14

- i) Define microstate and macrostate.
- ii) Write Laplacian operator D^2 in orthogonal curvilinear co-ordinates.
- iii) What is phase space ?
- iv) Deduce the Wein's displacement law from Planck's radiation formula.
- v) Define most probable speed and give its relation.
- vi) Define thermodynamic probability.
- vii) Define Fermions.
- viii) Define order and degree of differential equation with example.



3. A) Answer **any two** of the following : **10**
- i) Explain microcanonical and canonical ensemble.
 - ii) Obtain relation for average speed of gas molecules.
 - iii) Explain electronic specific heat.
- B) Derive an expression for total probability of a particular distribution. **4**
4. Answer **any two** of the following : **14**
- i) Derive Planck's radiation formula in terms of frequency and also in terms of wavelength.
 - ii) Deduce the Fermi-Dirac distribution law.
 - iii) What are thermodynamic functions ? Express them in terms of the boltzmann partition function.
5. Answer **any one** of the following : **14**
- i) Write Legendre's and Bessel's differential equation. State and prove Stoke's theorem.
 - ii) Obtain the gradient of scaler field in orthogonal curvilinear co-ordinates and derive the expression for curl of vector field.
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B.Sc. III (Semester – V) (New-CGPA) Examination, 2017
CHEMISTRY
Physical Chemistry (Special Paper No. – VII)

Time : 2½ Hours

Max. Marks : 70

- N.B. :** 1) *All questions are compulsory.*
2) *Figure to the right indicate full marks.*
3) *Neat diagrams must be drawn whenever necessary.*
4) *Use of logarithmic table/scientific calculator is allowed.*

1. Choose the most correct alternative for the following and rewrite the sentence. **14**
- i) $P + F = \underline{\hspace{2cm}}$ is called phase rule equation.
a) $c + 1$ b) $c + 2$ c) $c + 3$ d) all of these
- ii) The cell which converts chemical energy into electrical energy is called _____ cell.
a) electrolytic b) galvanic c) anodic d) cathodic
- iii) The light emitted from fire-fly is an example of _____
a) fluorescence b) phosphorescence
c) chemiluminescence d) delay-fluorescence
- iv) The point at which three phases remain in equilibrium is known as _____
a) triple point b) transition point c) eutectic point d) all of these
- v) Removal of electrons will take place at _____ electrode.
a) + ve b) – ve c) both d) none of these
- vi) _____ will play the effect on the rate of photochemical reaction.
a) Temperature b) Pressure c) Catalyst d) Light radiation
- vii) For a system $S_M \rightleftharpoons S_L \rightleftharpoons S_V$, the degree of freedom is _____
a) zero b) one c) two d) three
- viii) emf of the cell at equilibrium is _____
a) one b) two c) three d) zero



- ix) $\frac{dl}{dx} = -KIC$ is the mathematical representation of _____
 a) Lambert's law b) Beer's law c) Einstein's law d) Stark law
- x) In equation $E_c = E_c^\circ - \frac{RT}{nF} \ln Q_a$, Q_a represents _____
 a) Quantum value b) Einstein value
 c) Reaction quotient d) All of these
- xi) The quantity $(2s+1)$ is known as _____
 a) spin b) spin multiplicity
 c) orbit d) spin pairing
- xii) In concentration cells, emf is produced due to decrease in _____
 accompanying the cell reaction.
 a) free energy b) enthalpy c) entropy d) all of these
- xiii) Metal in contact with solution of metal ions containing mercury is called _____ electrode.
 a) amalgam b) metal insoluble salt
 c) metal-metal ion d) silver
- xiv) At 298 K, the value for $\frac{2.303 RT}{F} =$ _____
 a) 0.0295 b) 0.0395 c) 0.0591 d) 0.0191

2. Solve **any seven** of the following :

14

- i) State Gibbs phase rule and explain the terms involved in it.
- ii) What is congruent melting point ?
- iii) Explain with suitable example the metal-metal ion electrode.
- iv) Write the electrode reaction for reduction and expression for emf of the electrode $\overset{\ominus}{C}l, Cl_{2(g)} | Pt$.
- v) What are the equations for the determination of enthalpy and entropy change from the measurement of cell emf ?
- vi) What is reversible cell ?
- vii) What is Lambert's law ?
- viii) Define quantum efficiency.
- ix) What is chemiluminescence ?



3. A) Write notes on **any two** of the following : 10
- i) Discuss the application of phase rule to water system.
 - ii) Deduce Nernst equation for electrode potential.
 - iii) What are photosensitized reactions ? Explain with suitable example.
- B) Calculate emf of the concentration cell made up of cadmium in mercury amalgams using CdCl_2 as electrolyte solution at 298 K. One amalgam contains 20 mg of cadmium per gm of mercury and the other containing 0.4 mg per gm of mercury. $\left[\frac{2.303 RT}{F} = 0.0591 \right]$. 4
4. Attempt **any two** of the following : 14
- i) What is reduced phase rule ? Discuss the application of phase rule to lead-silver system.
 - ii) Derive expressions for the determination of thermodynamic parameters ΔG , ΔH and ΔS from emf measurements.
 - iii) Discuss in detail Jablonski diagram.
5. Attempt **any two** of the following : 14
- i) Derive an expression for emf of an electrode concentration cell without transference.
 - ii) The emf of a cell $\overset{\ominus}{\text{A}}_{\text{g}} | \text{Ag I in } 0.05 \text{ m KI} || 0.05 \text{ m Ag NO}_3 | \text{Ag}^{\oplus}$ is 0.788 V at 298 K. Calculate the solubility of silver iodide in water if AgNO_3 and KI are dissociated to the extent of 90%. $\left[\frac{2.303 RT}{F} = 0.059 \right]$.
 - iii) Define Stark-Einstein law. Calculate the energy in joules per quantum and joules per mole of photons of wavelength 400 nm.
-



4. Answer **any two** of the followings. (2×7=14)
- i) Describe the anatomy of rhizome of *Marsilea*.
 - ii) Describe the sporophyte of *Marchantia*.
 - iii) Describe the sex organs of *Chara*.
5. Answer **any two** of the followings. (2×7=14)
- i) Describe the sexual reproduction in *Ectocarpus*.
 - ii) Describe the morphology of *Marsilea* sporophyte.
 - iii) Describe the steps involved in Mushroom cultivation.
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Seat No.	
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**B.Sc. III (Semester – V) (New) (CGPA Pattern) Examination, 2017
ZOOLOGY (Special Paper – VII)
Non-Chordates**

Time : 2½ Hours

Max. Marks : 70

- N.B. :** 1) *All questions are compulsory.*
2) *Figures to the right indicate full marks.*
3) *Draw neat labelled diagrams wherever necessary.*

1. Select appropriate answer from each of the following and rewrite the sentence. **14**
- i) Autotrophic type of nutrition is found in
a) Amoeba
b) Paramecium
c) Trypanosoma
d) Euglena
- ii) Sexual reproduction in paramecium by _____ method.
a) budding
b) plasmotomy
c) binary fission
d) conjugation
- iii) In sycon canal system found is _____ type.
a) Ascon
b) Syconoid
c) Leuconoid
d) Rhagon
- iv) In coelenterates _____ zooids are concerned with reproduction.
a) Gastrozooids
b) Gonozooids
c) Dactylozooids
d) Skeletozooids
- v) _____ is the earliest and the basic larval stage in crustacea.
a) Nauplius
b) Metanauplius
c) Zoea
d) Mysis
- vi) In insects metamorphosis is regulated by
a) Pheromone
b) Juvenile hormone
c) Ecdysome
d) Brain hormone



- vi) Sycon type canal system.
 - vii) Cyclosis in paramoecium.
 - viii) Affinities of lingula.
 - ix) Epidermal glands in leech.
3. A) Write notes on **any two** of the following : **10**
- i) Polymorphism in physalia.
 - ii) Holozoic nutrition in protozoa.
 - iii) Zoological importance of peripatus.
- B) Describe parasitic adaptations in leech. **4**
4. Attempt **any two** of the following : **14**
- i) Describe conjugation in paramoecium.
 - ii) Describe with suitable diagram male reproductive system of leech.
 - iii) Describe haemal and perahaemal system in sea-star.
5. Attempt **any two** of the following : **14**
- i) Describe with suitable diagram excretory system of leech.
 - ii) Describe various insect larvae.
 - iii) Describe with suitable diagram digestive system of sea-star.
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B.Sc. – III (Semester – V) (CGPA) Examination, 2017
MATHEMATICS (New)
Algebra – II (Special Paper – VII)

Time : 2½ Hours

Max. Marks : 70

Instructions: 1) *All questions are compulsory.*
2) *Figures to the right indicate full marks.*

1. Choose the most correct alternative for the following and rewrite the sentence. **14**1) The characteristic of the ring $2\mathbb{Z} \times \mathbb{Z}_7$ is

- a) 14 b) 2 c) 7 d) 0

2) If $u = (1, 1, 2) \in \mathbb{R}^3$. Then $\frac{u}{\|u\|} =$

- a)
- $\frac{(1, 1, 2)}{5}$
- b)
- $\frac{(1, 1, 2)}{\sqrt{5}}$
- c)
- $\frac{(1, 1, 2)}{\sqrt{6}}$
- d)
- $(1, 1, -2)$

3) Let $T : V_3 \rightarrow V_3$ be a linear map defined by $T(x_1, x_2, x_3) = (x_1, x_2, 0)$. Then $N(T) =$

- a)
- $[(0, 0, 0)]$
- b)
- $[(1, 0, 0)]$
- c)
- $[(0, 1, 0)]$
- d)
- $[(0, 0, 1)]$

4) Let $x = (2, 1 + i, i)$. Then $\|x\| =$

- a) 7 b)
- $\sqrt{7}$
- c) 5 d)
- $\sqrt{9}$

5) Let V and W be finite dimensional vector spaces and $T : V \rightarrow W$ is linear. If $\dim(V) < \dim(W)$ then

- a)
- T
- cannot be onto b)
- T
- cannot be one-one
-
- c)
- T
- cannot be both 1-1 and onto d) None of these

6) The span of ϕ is

- a)
- ϕ
- b)
- $\{0\}$
- c)
- V
- d)
- W

7) Let $T : V \rightarrow W$ be linear, V and W are vector spaces then $\text{rank}(T) + \text{nullity}(T) =$

- a)
- $\dim(V)$
- b)
- $\dim(W)$
-
- c)
- $\dim(V) - \dim(W)$
- d)
- $\dim(V) + \dim(W)$



- 8) The zero-divisors in Z_6 are
 a) $\{0\}$ b) $\{2, 3\}$ c) $\{0, 2, 3, 4\}$ d) $\{2, 3, 4\}$
- 9) $T : R^2 \rightarrow R^3$ be linear transformation defined by $T(x, y) = (x + y, x - y, 2x - 5y)$,
 β and γ are standard ordered basis for R^2 and R^3 then $[T]_{\beta}^{\gamma} =$

a) $\begin{bmatrix} 1 & 1 \\ 1 & -1 \\ 2 & -5 \end{bmatrix}$ b) $\begin{bmatrix} 1 & 1 & 2 \\ 1 & -1 & -5 \end{bmatrix}$ c) $\begin{bmatrix} 1 & 1 \\ -1 & 1 \\ 5 & 2 \end{bmatrix}$ d) $\begin{bmatrix} 2 & 1 & 1 \\ -5 & -1 & 1 \end{bmatrix}$

- 10) The vector space $M_{n \times n}(F)$ has dimension
 a) 0 b) n^2 c) n d) $2n$
- 11) Let V be a vector space and let $S_1 \subseteq S_2 \subseteq V$ and p) S_1 is linearly dependent
 q) S_2 is linearly dependent then
 a) $p \Rightarrow q$ b) $q \Rightarrow p$ c) $p \Leftrightarrow q$ d) None of these
- 12) The number of ideals in the ring of rational number is
 a) 1 b) 2 c) Infinite d) 5
- 13) Which structure is not a field ?
 a) $(R, +, \cdot)$ b) $(C, +, \cdot)$ c) $(E, +, \cdot)$ d) $(Q, +, \cdot)$
- 14) If $x = (1, 2, 3) \in R^3$, then $\sqrt{1^2 + 2^2 + 3^2} =$
 a) $\sqrt{\langle x, x \rangle}$ b) $\langle x, x \rangle$ c) $\langle x, x \rangle^2$ d) $\|x\|^2$

2. Attempt **any seven** :

14

- 1) Define the term integral domain and give one example.
- 2) Show that the following is a subring of $M(Z, \mathbb{Z})$.

$$S = \left\{ \begin{bmatrix} a & b \\ 0 & c \end{bmatrix} : a, b, c \in Z \right\}$$
- 3) Show that the set $S = \{(1, 1, 0), (1, -1, 1), (-1, 1, 2)\}$ is an orthogonal set.
- 4) Let $x = (2, 1 + i, i)$ and $y = (2 - i, 2, 1 + 2i)$ be vectors in C^3 . Compute $\langle x, y \rangle$ and $\|x + y\|$.
- 5) Find all ideals of Z_{18} .
- 6) If T be a linear map on R^2 defined by $T(x_1, x_2) = (2x_1 + 3x_2, x_1 - x_2)$. Show that T is one-one and onto.



- 7) Show that $S = \{(1, 2, 4), (1, 0, 0), (0, 1, 0), (0, 0, 1)\}$ is a linearly dependent.
- 8) Let $T_1, T_2 : \mathbb{R}^3 \rightarrow \mathbb{R}^2$ be the linear transformations given by
 $T_1(x, y, z) = (2x, y + z)$ and $T_2(x, y, z) = (x - z, y)$. Find $T_1 + T_2$ and $2T_1 + 3T_2$.
- 9) Show that $\beta = \{(2, 5), (1, 1)\}$ is a basis of \mathbb{R}^2 .

3. A) Attempt **any two** of the following : 10

- 1) Show that every field is an integral domain.
- 2) Determine whether the following sets are linearly dependent or linearly independent $\{(1, -1, 2), (1, -2, 1), (1, 1, 4)\}$.
- 3) Let $T : P_3(\mathbb{R}) \rightarrow P_2(\mathbb{R})$ be the linear transformation defined by $T[f(x)] = f'(x)$. Let β and γ be standard ordered basis for $P_3(\mathbb{R})$ and $P_2(\mathbb{R})$ then find $[T]_{\beta}^{\gamma}$.

B) Let V be an inner product space then for $x, y, z \in V$ and $c \in F$ then prove that 4

- a) $\langle x, y + z \rangle = \langle x, y \rangle + \langle x, z \rangle$
- b) $\langle x, cy \rangle = \bar{c} \langle x, y \rangle$.

4. Attempt **any two** of the following : 14

- 1) Let V be the vector space over F prove that polar identities for all $x, y \in V$.
$$\langle x, y \rangle = \frac{1}{4} \|x + y\|^2 - \frac{1}{4} \|x - y\|^2$$
- 2) $T : \mathbb{R}_2 \rightarrow \mathbb{R}_3$ is linear map defined by $T(1, 1) = (1, 0, 2)$, $T(2, 3) = (1, -1, 4)$. Find $T(a, b)$. In particular find $T(8, 11)$.
- 3) Let V and W be vector spaces over a field F and Let $T : V \rightarrow W$ and $U : V \rightarrow W$ are linear then show that for all $a \in F$, $aT + U$ is linear.

5. Attempt **any two** of the following : 14

- 1) State and prove Dimension theorem.
 - 2) Show that the set of member of $a + b\sqrt{2}$ with a, b as rational number is a field.
 - 3) Show that the polynomial $2x^2 + 3x + 5$ belongs to span (S) , where $S = \{x^2 + 1, x, 2x + 3\}$.
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Seat No.	
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B.Sc. – III (Semester – V) (New) (CGPA) Examination, 2017
STATISTICS
Statistical Inference – I (Special Paper – VII)

Time : 2.30 Hours

Max. Marks : 70

N.B. : All questions carry equal marks.

1. Choose the correct alternative :

14

- 1) Which of the following is an estimation procedure ?
 - a) Point estimation
 - b) Interval estimation
 - c) Both a) and b)
 - d) None of these
- 2) Parameter is
 - a) Sample characteristic
 - b) Population characteristic
 - c) Both a) and b)
 - d) None of these
- 3) An estimator T_n is said to be sufficient statistic for parameter θ if it contains all the information which is contained in
 - a) Population
 - b) θ
 - c) Sample
 - d) None of these
- 4) If T is consistent estimator of θ then
 - a) T is also consistent estimator of θ^2
 - b) T^2 is also consistent of θ
 - c) T^2 is also consistent of θ^2
 - d) None of these
- 5) By the method of moments one can estimate
 - a) All constants of a population
 - b) Only mean and variance of a distribution
 - c) All moments of population parameters
 - d) All the above



- 6) If the variance of an estimator attains the Cramer-Rao lower bound then the estimator is
- a) Most efficient b) Sufficient c) Consistent d) Admissible
- 7) If T_n and T_n^* are two unbiased estimators of parameter θ such that $V(T_n) = V(T_n^*)$ then
- a) T_n and T_n^* may not be same b) $T_n = T_n^*$
c) T_n is more efficient d) None of the above
- 8) The maximum likelihood estimators which are obtained by maximizing the function of joint density of random variables are generally
- a) Unbiased and inconsistent b) Unbiased and consistent
c) Consistent and invariant d) Invariants and unbiased
- 9) If T_n is consistent estimator of θ then e^{T_n} is
- a) Unbiased estimator of e^θ
b) Consistent estimator of e^θ
c) Minimum variance unbiased estimator of e^θ
d) None of the above
- 10) For a random sample x_1, x_2, \dots, x_n from a population $N(\mu, \sigma^2)$ the maximum likelihood estimator of σ^2 is
- a) $\frac{1}{n} \sum (x_i - \bar{x})^2$ b) $\frac{1}{n-1} \sum (x_i - \bar{x})^2$
c) $\frac{1}{n} \sum (x_i - \mu)^2$ d) $\frac{1}{n-1} \sum (x_i - \mu)^2$
- 11) If $E(T_n) > \theta$ then T_n is said to be
- a) Unbiased b) Positively biased
c) Negatively biased d) None of these
- 12) Let X_1, X_2 is random sample from $U(0, \theta)$ then MLE of θ is
- a) $X_1 + X_2$ b) $X_1 X_2$
c) $\text{Max}(X_1, X_2)$ d) $\text{Min}(X_1, X_2)$



- 13) If X is a single observation from $N(0, \sigma^2)$ then the sufficient statistic for σ^2 is
a) $|X|$ b) X c) X^2 d) None of these
- 14) A sample constant representing a population parameter is known as
a) Estimate b) Estimator c) Statistic d) None of these

2. Attempt **any seven** from the following : **14**

- 1) Define parameter, parameter space.
- 2) Give one example of unbiased estimator but not consistent.
- 3) Define sampling distribution of an estimator.
- 4) If X_1, X_2, \dots, X_n be a random sample from $U(0, \theta)$, show that $T = 2\bar{X}$ is unbiased estimator of θ where \bar{X} is the sample mean.
- 5) Find the estimate of the parameter λ of the Poisson distribution by the method of moments

X :	0	1	2	3	4
f :	16	10	8	2	1
- 6) Define maximum likelihood estimator.
- 7) Write down the expression for the likelihood function of a random sample x_1, x_2, \dots, x_n drawn from the distribution $f(x, \theta) = \theta \cdot e^{-\theta x}$ $x > 0$.
- 8) Prove that sample SD is always biased estimator of population SD.
- 9) Explain relative efficiency.

3. A) Answer **any two** of the following : **10**

- 1) Show that the estimator T_n such that $E(T_n) = \theta_n + \theta$ and $V(T_n) = \sigma_n^2$ then T_n is consistent estimator of θ if $\theta_n \rightarrow 0$ and $\sigma_n^2 \rightarrow 0$ as $n \rightarrow \infty$.
- 2) Show that sample mean \bar{X} is sufficient statistic for parameter λ of Poisson distribution.
- 3) Obtain estimator of θ by the method of moments :

$$f(x, \theta) = (1 + \theta)x^\theta \quad 0 < x < 1.$$

- B) Prove that two distinct unbiased estimators of $\phi(\theta)$ gives rise to infinitely many unbiased estimators of $\phi(\theta)$.



4. Attempt **any two** of the following :

14

1) If X_1, X_2, X_3 are independent sample values from Poisson distribution with

$$\text{parameter } \lambda \text{ and if } T_1 = \frac{X_1 + 2X_2 + 3X_3}{6}, T_2 = \frac{X_1 + X_2 + X_3}{3},$$

$$T_3 = \frac{X_1 + X_2}{2} + X_3. \text{ Find}$$

a) Which of these statistics are unbiased ?

b) Which is more efficient ?

2) Let L is likelihood function of random sample X_1, X_2, \dots, X_n from $f(x, \theta)$ show

$$\text{that } E\left(\frac{\partial \log L}{\partial \theta}\right)^2 = -E\left(\frac{\partial^2 \log L}{\partial \theta^2}\right).$$

3) Obtain the estimates of α and β by the method of moments

$$f(x, \alpha, \beta) = \frac{\beta^\alpha}{\Gamma(\alpha)} e^{-\beta x} x^{\alpha-1}.$$

5. Attempt **any two** of the following :

14

1) State and prove Cramer-Rao inequality.

2) Let X_1, X_2, \dots, X_n be a random sample from $N(\mu, \sigma^2)$ population obtain sufficient statistic for

a) μ when σ^2 is known

b) σ^2 when μ is known

c) μ and σ^2 both are unknown.

3) Define Uniformly Minimum Variance Unbiased Estimator (UMVUE) and show that it is unique when it exists.



- 7) Formation of zebra like magnetic stripping takes place at
a) Mid oceanic ridges b) Sea face
c) On continent d) On mountains
- 8) Sea floor spreading can be evidenced with presence of
a) Plate boundaries b) Zebra like magnetic stripping
c) Volcano d) Marine trenches
- 9) Continents moves mainly due to
a) Volcano b) Earthquakes
c) Rocks d) Convection currents
- 10) Two plates moves away in _____ type of movement.
a) Convergent b) Divergent
c) Uplift d) Plume formation
- 11) Which one of the following plates is larger plate ?
a) China plate b) Arabian plate c) Cocos plate d) Indian
- 12) Epeiros means
a) Ocean b) Crust c) Sea floor d) Continent
- 13) Height of mountain is greater than _____ m.
a) 510 b) 610 c) 810 d) 1010
- 14) Mid-Atlantic oceanic ridge is an example of _____ plate boundary.
a) Transform fault b) Divergent c) Convergent d) Passive

2. Answer **any seven** of the following :

14

- i) Draw figure, representing Pratt's hypothesis.
- ii) Volcanic mountain.
- iii) Wegener's concept of continental drift.
- iv) Define the mountain.
- v) What are two types of plate boundaries ?
- vi) What are types of orogenic forces ?
- vii) What is tectonics ?
- viii) What is orogeny ?
- ix) What is Sea floor ?



3. A) Answer **any two** of the following : **10**
- i) Characters of plate.
 - ii) Pratt's hypothesis.
 - iii) Describe concept of plate tectonics. Draw diagram.
- B) Describe supporting evidences for continental drift. **4**
4. Answer **any two** of the following : **14**
- i) Describe hot plumes.
 - ii) Convergent plate and their characters.
 - iii) Observations on the sea floor for tectonic evidences.
5. Answer **any two** of the following : **14**
- i) Benioff zone.
 - ii) Describe divergent plate boundaries.
 - iii) Distinguish between plate margin and plate boundary.
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Seat No.	
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B.Sc. – III (Semester – V) (New CGPA) Examination, 2017
MICROBIOLOGY
Special Paper – VII : Virology, Extremophiles and Bioinformatics

Time : 2½ Hours

Max. Marks : 70

N.B. : 1) **All questions are compulsory.**
2) Figures to **right** indicate **full** marks.

1. Rewrite the sentences after choosing correct answer from the given alternatives.

14

- 1) _____ phage contain 12 capsomers in its capsid.
a) λ phage b) T4 phage c) MS2 phage d) ϕ X-174 phage
- 2) On denaturation of DNA, panhandle structures are produced in _____ virus.
a) Papiloma b) Adeno
c) Influenza d) SV40
- 3) One step Growth Experiment was devised by
a) Watson b) Crick
c) Lederberg d) Ellis and Delbruck
- 4) Multiplication of influenza virus occurs in
a) Cytoplasm b) Nucleus
c) Mitochondria d) Ribosome
- 5) The phage ϕ X-174 contain _____ as its genome.
a) Circular DS DNA b) Linear SS DNA
c) Circular SS DNA d) Linear DS RNA
- 6) _____ is DNA containing oncogenic virus.
a) Rous Sarcoma virus b) Mammary Tumor virus
c) Epstein-Barr virus d) Leukemia virus



- v) What is psychrophile ? Give its example.
 - vi) Define antigenic shift and drift.
 - vii) What is Cro repressor ? Give its role.
 - viii) What is DDBJ and EMBL ? Give their role.
 - ix) What is PDB ? Give its importance.
3. A) Answer **any two** of the following : **10**
- a) Describe briefly different methods used for cultivation of animal viruses.
 - b) Give brief account of PDB and GenBank.
 - c) Discuss in detail the reproduction in Adenovirus.
- B) Discuss the adsorption and penetration of T4 phage. **4**
4. Answer **any two** of the following : **14**
- i) Describe the immunity operon and discuss the maintenance of λ lysogeny.
 - ii) Briefly explain intracellular development of influenza virus.
 - iii) Give brief account of extremophiles.
5. Answer **any two** of the following : **14**
- i) Describe in detail the Pock and Plaque assay method of enumeration of viruses.
 - ii) Give the detailed account of characteristics of cancerous cells.
 - iii) Describe briefly use of bioinformatics in major research areas.
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Seat No.	
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B.Sc. – III (Semester – V) (New C.G.P.A.) Examination, 2017
ELECTRONICS (Special Paper – VII)
Linear Integrated Circuits and Applications

Time : 2½ Hours

Max. Marks : 70

- N.B. :** 1) *All questions are compulsory.*
2) *Figures to the right indicate full marks.*
3) *Draw neat labelled diagram wherever necessary.*
4) *Use of log table and calculator is allowed.*

1. Select the correct alternative for the following : **14**
- i) The component which is not possible to fabricate in IC is
a) Diode b) Resistor c) Inductor d) Capacitor
 - ii) _____ filter has maximum flat pass and stop bands.
a) Butterworth b) Chebyshev
c) Elliptic d) None of these
 - iii) A chip having more than 3000 logic gate is known as _____ chip.
a) SSI b) MSI c) LSI d) VLSI
 - iv) In second order low pass filter the number of RC combination is
a) one b) two c) three d) four
 - v) For a wide band stop filter using LPF and HPF, the cut off frequency of HPF must be _____ cut off frequency of LPF.
a) less than b) equal to c) greater than d) none of these
 - vi) In IC regulator _____ is used to increase the current capacity of the regulator.
a) reference voltage source b) pass transistor
c) error amplifier d) none of these
 - vii) IC 7805 is a _____ voltage regulator.
a) fixed positive b) fixed negative
c) adjustable positive d) adjustable negative



- viii) In PLL lock range is ____ capture range.
a) less than b) equal to c) greater than d) none of these
- ix) _____ is not the part of PLL.
a) Phase detector b) Error amplifier
c) High pass filter d) None of these
- x) The main job of voltage regulator is to provide a nearly _____ output voltage.
a) Sinusoidal b) Constant c) Smooth d) None of these
- xi) Which of the following IC is used for audio amplifier ?
a) LM 386 b) IC 565 c) IC 0808 d) IC 0809
- xii) IC _____ is a phase locked loop.
a) 565 b) 556 c) LF 198 d) LF 356
- xiii) _____ filter is also known as notch filter.
a) Low pass b) High pass
c) Narrow band-pass d) Narrow band-reject
- xiv) _____ can be used to have direct dB display on digital voltmeter and spectrum analyser.
a) Log amplifier b) Antilog-amplifier
c) S/H Circuit d) Precision rectifier

2. Answer **any seven** from the following (2 marks **each**) :

14

- i) What do you mean by passive and active filters ?
- ii) Give the different methods of fabricating resistor in IC.
- iii) What are the advantages of IC voltage regulator ?
- iv) Define lock range and capture range in PLL.
- v) List the basic building blocks of PLL.
- vi) What is the purpose of having input and output capacitors in three terminal IC regulators ?
- vii) In second order low pass filter $R_1 = R_2 = 1 \text{ K}\Omega$ and $C_1 = C_2 = 0.1 \mu\text{F}$. Calculate cut off frequency.



- viii) Draw block diagram of IC regulator.
- ix) In regulated power supply calculate the value of R_{ac} for a load current of 500 mA.
Given $V_{sense} = 0.5$ Volt.
3. A) Answer **any two (5 marks each)** : **10**
- i) Explain sample and hold circuit.
 - ii) Draw the pin configuration of IC LM 317 and state the expression for its output voltage.
 - iii) Derive the expression for lock range of PLL.
- B) Explain second order low pass filter. **4**
4. Answer **any two (7 marks each)** : **14**
- i) Draw and explain F to V converter using LM 331.
 - ii) Explain peak clamper circuit using op-Amp and draw I/P-O/P waveforms.
 - iii) Explain the use of PLL as
 - a) Frequency multiplier
 - b) FSK demodulator.
5. Answer **any two (7 marks each)** : **14**
- i) What is epitaxial process ? Explain epitaxial process used in IC fabrication.
 - ii) Explain log and Antilog amplifier using op-Amp.
 - iii) Explain principle and working of PLL.
-



- 8) The _____ is a user defined integer type which provides a way for attaching names to numbers.
a) structure b) class c) enumeration d) union
- 9) _____ represents a kind of relationship between two classes.
a) Inheritance b) Abstraction c) Interface d) Class
- 10) _____ is location indicators and are used to access class object.
a) Indexer b) Properties c) Array d) None
- 11) A local variable _____
a) Can be used anywhere in program
b) Represents a class object
c) Is declared within method
d) None
- 12) The virtual may be used as method modifier.
a) true b) false
- 13) _____ classes supports binary file.
a) Binary Writer b) File c) File Stream d) None
- 14) A property that omit get clause is referred to as write only.
a) True b) False

2. Answer **any seven** of the following :

14

- 1) Explain Garbage collection.
- 2) Explain try and catch block.
- 3) Explain boxing and unboxing.
- 4) Explain Abstract class.
- 5) Define method overriding.
- 6) Explain File class.
- 7) Explain read only fields.
- 8) Command line argument.
- 9) Define Thread.



3. A) Answer **any two** of the following : **10**
- 1) What is Constructor ? Explain type of constructors with examples.
 - 2) Define namespaces. Explain nested namespace.
 - 3) Write difference between method overloading and method overriding.
- B) Explain Thread Life Cycle with suitable diagram. **4**
4. Answer **any two** of the following : **14**
- 1) Write a program to implement custom exception where user will take ACNO and amount as input if amount > balance raise custom exception out_of_bal.
 - 2) Explain CLR, CTS, CLS.
 - 3) What is operator overloading ? List the operators that can be overloading and can't be overloaded.
5. Answer the following (**any two**) : **14**
- 1) Write a program to copy content of one file to another.
 - 2) Write a program to implement thread synchronization.
 - 3) Explain indexer with suitable example.
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B.Sc. – III (Semester – V) (CGPA Pattern) Examination, 2017
PHYSICS (Special Paper – VIII) (New)
Solid State Physics

Time : 2.30 Hours

Total Marks : 70

1. Select correct alternatives :

14

- i) Total number of atoms in HCP cell are _____
a) One b) Two c) Three d) Four
- ii) Total number of atoms in unit cell of BCC structure is/are _____
a) One b) Two c) Three d) Four
- iii) The coordination number of simple cubic structure is _____
a) Three b) Six c) Nine d) Twelve
- iv) Band gap energy of Germanium is _____
a) 1.1 eV b) 0.7 eV c) 7 eV d) 0 eV
- v) For pure metals, electrical conductivity (σ) is proportional to _____
a) T b) T^2 c) $1/T$ d) T^3
- vi) Wiedmann-Franz relation is _____
a) $(K/\sigma) \propto T$ b) $(K/\sigma) \propto T^{-1}$
c) $(K/\sigma) \propto T^2$ d) $(\sigma/K) \propto T$
- vii) Infinite potential well type model proposed by _____
a) Drude-Lorentz b) Sommerfelds
c) Kronig d) Hall
- viii) Below Fermi energy state, all the energy states are _____
a) Completely filled b) Completely empty
c) Always empty d) None of these
- ix) The quantum states E_{122} and E_{221} are _____
a) Degenerate energy states
b) Non-degenerate energy states
c) Degenerate as well as non-degenerate energy states
d) Some times non-degenerate energy states



4. Solve **any two** of the following : **14**

- i) Explain the principle of powder method of X-ray diffraction and draw the experimental arrangement and traces obtained from X-ray diffraction by crystal.
- ii) Write short note on hysteresis.
- iii) Differentiate type-I and type-II superconductors from each other.

5. Solve **any one** of the following : **14**

- i) A) Derive the expression for electrical conductivity (σ), thermal conductivity (K) and Wiedmann-Franz relation for any metal.
B) Draw the planes (100), (010), (001) and (111).
 - ii) A) Distinguish between metals, semiconductors and insulators on the basis of band theory of solids.
B) Problem : In a sodium chloride crystal ($a = 2.814$ A.U.), the second order reflection is observed from the plane (100) by using monochromatic X-ray beam of wavelength 0.71 A.U. Calculate the angle of diffraction to observe the above reflection.
-



- 7) In fast breeder reactors _____ material is used.
a) Fertile b) Fissile c) Radioactivity d) All of these
- 8) _____ is essential metal for biological process.
a) Ca b) Ni c) Co d) Cr
- 9) Metalloporphyrins are
a) Simple Salt b) Metal Complex
c) Metal Chelates d) Double Salts
- 10) Myoglobin contains _____ heme units.
a) 2 b) 3 c) 0 d) 1
- 11) _____ is a natural polymer.
a) Terylene b) Wool c) PVC d) PE
- 12) In Silicon polymers, Si-o linkage is more stable due to presence of _____ bonding.
a) $p\pi - p\pi$ b) $d\pi - p\pi$ c) $d\pi - d\pi$ d) $d\sigma - d\sigma$
- 13) The Backbone in Fleocarbons consists of _____ structural unit.
a) F – F b) C – H c) C – F d) C – C
- 14) The particle size of nano materials is in the range of _____ nm.
a) 1 to 100 b) 100 to 200 c) 100 to 1000 d) 0.1 to 1

2. Answer **any seven** of the following :

14

- 1) Define the terms :
a) Exothermic reaction b) Endothermic reaction.
- 2) What is induced reaction ?
- 3) What are homoatomic and heteroatomic polymer ?
- 4) What is the function of hemoglobin ?
- 5) Explain copolymer.
- 6) What are the applications of silicones ?
- 7) Explain the use of nano materials in energy field.
- 8) Show the crystal field splitting in $[\text{COF}_6]^{-3}$ complex.
- 9) What are high spin and low spin complexes ?



3. A) Attempt **any two** of the following : **10**
- 1) What is crystal field splitting ? Explain it for octahedral complex with suitable example.
 - 2) Describe the nature of oxygen binding curves of hemoglobin and myoglobin.
 - 3) Discuss the applications of nanotechnology.
- B) Explain in brief dating of carbon-14 **4**
4. Answer **any two** of the following : **14**
- 1) With the help of MO diagram, explain the formation of $[\text{Co}(\text{NH}_3)_6]^{+3}$ complex. Comment on its magnetic property.
 - 2) Describe in detail nuclear fusion.
 - 3) Explain function, structure and working of myoglobin.
5. Answer **any two** of the following : **14**
- 1) What is the chain reaction ? Explain in detail uncontrolled chain reaction.
 - 2) Distinguish between organic and inorganic polymers.
 - 3) What is the crystal field stabilization energy ? Calculate CFSE for d^4 case for octahedral complex in weak field and strong field with neat diagram.
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**B.Sc. III (Semester – V) Examination, 2017
BOTANY (Special Paper – VIII) (New CGPA)
Gymnosperm and Palaeobotany**

Time : 2½ Hours

Max. Marks : 70

- Instructions :** 1) **All questions are compulsory.**
2) **All questions carry equal marks.**
3) **Draw neat labelled diagrams wherever necessary.**
4) **Figures to the right indicate full marks.**

1. Rewrite the following sentences by choosing correct alternatives : **14**
- 1) In *Zamia* the subterrenean stem is _____ shaped.
a) Conical b) Cylindrical c) Turnip d) Rhizomatic
 - 2) The leaves of *Zamia* are
a) Unipinnately compound b) Bipinnately compound
c) Tripinnately compound d) Needle like
 - 3) In *Zamia* rachis the xylem is
a) Centripetal b) Centrifugal
c) Both a and b d) None of these
 - 4) The phyllotaxy in *Gnetum* is
a) alternate b) opposite
c) whorled d) decussate and opposit
 - 5) The pollination in *Zamia* is
a) Entemophilous b) Hydrophilous
c) Anemophilous d) Ornithophylous
 - 6) Most of the characters of *Gnetum* are homologous with
a) Dicot angiosperms b) Monocot – angiosperm
c) Bryophytes d) Pteridophytes

P.T.O.



- 7) *Calamite* is a name for
a) stem b) pith cast c) leaf d) root
- 8) The flowers of fossils group _____ born in axil of leaf bases
a) Cycadeoidea b) Calamite
c) Lyginopteris d) Enigmocarpon
- 9) Mesozoic era is called as age of
a) Pteridophytes b) Gymnosperms
c) Algae and Fungi d) Angiosperms
- 10) _____ is used to calculate the geological age of fossil specimen.
a) S¹⁴ b) N¹⁴ c) C¹⁴ d) P¹⁴
- 11) Coal is _____ type of fossil.
a) Impression b) Compression
c) Petrification d) Amber
- 12) _____ is a separate generic name for each organs of fossil plants.
a) Organ genera b) Specific genera
c) Plant genera d) Group genera
- 13) Fibrous bands are seen in cortex of _____ stem.
a) *Calamite* b) *Cycadeoidea*
c) *Lyginopteris* d) *Enigmocarpon*
- 14) _____ play important role in oil exploration.
a) Microfossils b) Chemical fossils
c) Pseudofossils d) Amber

2. Answer **any seven** of the following :

14

- i) Give systematic position of *Gnetum*.
- ii) Sketch and label sporophytic plant body of *Zamia*.
- iii) Give economic importance of *Gnetum*.
- iv) Characters of spermatozoids in *Zamia*.



- v) Define geological time scale.
 - vi) Enlist periods of Mesozoic era.
 - vii) What are form genera ?
 - viii) Define Amber.
 - ix) What is oil exploration ?
3. A) Answer **any two** of the following : **10**
- i) Give fossil flora of Mesozoic era.
 - ii) Sketch, label and describe female strobili of *Gnetum*.
 - iii) Describe the male frutification of *Lyginopteris*.
- B) Describe the process of carbon dating. **4**
4. Answer **any two** of the following : **14**
- i) Describe sexual reproduction in *Zamia*.
 - ii) Describe any three types of fossil studied by you.
 - iii) What are fossils ? Describe the process of fossilization.
5. Answer **any two** of the following : **14**
- i) What is anomalous secondary growth ? Describe the anomalous growth in *Gnetum ula* stem.
 - ii) Describe the fossil fruit genera *Enigmocarpon*, comment up on its taxonomical position.
 - iii) Explain the evidence that prove coal and oil are biotic in origin.
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**B.Sc. (Part – III) (Semester – V) (CGPA Pattern) (New) Examination, 2017
ZOOLOGY (Special Paper – VIII)
(Biostatistics, Bioinformatics, Medical Zoology and Evolutionary Genetics)**

Time : 2½ Hours

Total Marks : 70

Instructions : 1) **Draw neat labeled diagrams wherever necessary.**
2) **Figures to right indicate full marks.**

1. Rewrite the following sentences choosing correct answer from given alternatives : **14**

- 1) The systematic arrangement of data in column in the graph is called _____
 - a) Frequency curve
 - b) Histogram
 - c) Ogive curve
 - d) Frequency distribution
- 2) In the perfect +ve correlation the value of 'r' is _____
 - a) +01
 - b) +1
 - c) 0.5
 - d) -1
- 3) The applications of statistics in the biological science is called _____
 - a) Bioinformatics
 - b) Biotechnology
 - c) Biostatistics
 - d) Biochemistry
- 4) The systematic arrangement of data in a table is called as _____
 - a) Standard deviation
 - b) Histogram
 - c) Coefficient correlation
 - d) Classification and tabulation
- 5) _____ is defined as a systematic arrangement of data in rows and sentences.
 - a) Tabulation
 - b) Frequency distribution
 - c) Co-relation
 - d) Histogram
- 6) The command Ctrl+A is used for _____ in the bioinformatics.
 - a) to delete all
 - b) to save all
 - c) to select all
 - d) to cut all



- vi) Ebola
- vii) Malaria
- viii) Genetic drift
- ix) Computer processing unit.

3. A) Answer **any two** of the following : **10**
i) Describe the disease tuberculosis.
ii) Give an account of pathogenesis and treatment of fasciolasis.
iii) Describe applications of search engines in bioinformatics.

B) Define median. Calculate median from following data : **4**

No. of students	5 – 9	10 – 14	15 – 19	20 – 24	25 – 29	30 – 34
Marks	3	5	6	4	3	4

4. Answer **any two** of the following : **14**
i) Give an account of dengue disease.
ii) Describe the Hardy-Weinberg law of equilibrium.
iii) Explain Spearman’s correlation coefficient.

5. Answer **any two** of the following : **14**
i) Describe the three levels of bioinformatics.
ii) What are the measurements of central tendency ? Describe the mean.
iii) Define statistical table. Describe its different parts.



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B.Sc. – III (Semester – V) (New CGPA Pattern) Examination, 2017
MATHEMATICS (Special Paper – VIII)
Complex Analysis

Time : 2½ Hours

Max. Marks : 70

N.B. : i) *All questions are compulsory.*
ii) *Figures to the right indicate full marks.*

1. Choose the correct alternative of the following : 14
- 1) If harmonic function u and v satisfy Cauchy's Riemann equations then $u + iv$ is
 - a) closed
 - b) not closed
 - c) an analytic
 - d) not analytic
 - 2) Two families are orthogonal then the product of slope is
 - a) -1
 - b) 1
 - c) 0
 - d) None of these
 - 3) Construct the analytic function, if $u = y^3 - 3x^2y$
 - a) $(z^3 + c)$
 - b) $i(z^3 + c)$
 - c) $(z^2 + c)$
 - d) $i(z^2 + c)$
 - 4) If $u = x^3 - 3xy^2$ then analytic function $f(z) =$
 - a) $z^3 + c$
 - b) $z^2 + c$
 - c) $z + c$
 - d) none of these
 - 5) If $z = z(t)$ on the interval $a \leq t \leq b$. An arc L is said to be differentiable, if
 - a) $z'(t)$ exist and not continuous
 - b) $z'(t)$ does not exist but continuous
 - c) $z'(t)$ exist and continuous
 - d) none of these
 - 6) The inequalities $a = t_0 < t_1 < t_2 < \dots < t_{n-1} < t_n = b$ and greatest of the numbers, $t_1 - t_0, t_2 - t_1, \dots, t_n - t_{n-1}$ is called _____ of the partition.
 - a) Closed curve
 - b) Norm
 - c) Arc
 - d) Partition
 - 7) An arc L is simple or a Jordan arc if $z(t_1) = z(t_2)$ only when ____
 - a) $t_1 = t_2$
 - b) $t_1 \neq t_2$
 - c) $t_1 - t_2$
 - d) $t_1 + t_2$

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- 8) The equation $z = z(t) = x(t) + iy(t)$, $a \leq t \leq b$ and $x(t)$, $y(t)$ are continuous function of t represent on _____ in the complex plane.
 a) Closed curve b) Arc c) Partition d) Norm
- 9) If C is the circle $|z - a| = r$ then $\int_C \frac{dz}{z - a}$ is
 a) $2\pi i$ b) $-2\pi i$ c) πi d) 0
- 10) If $f(z) = u + iv$ is analytic function in a finite region and $u = x^2 - y^2$ then v is _____
 a) $2xy + c$ b) $3xy + c$ c) $4xy + c$ d) $xy + c$
- 11) If $z = a$ is simple pole of $f(z)$, then the residue at $z = a$ is _____
 a) $\lim_{z \rightarrow a} (z - a)$ b) $\lim_{z \rightarrow a} f(z)$
 c) $\lim_{z \rightarrow a} (z - a)f(z)$ d) None of these
- 12) The residue of $\frac{1}{z^2 + 1}$ at $z = i$ is
 a) $\frac{1}{2}$ b) $-\frac{1}{2}$ c) $\frac{1}{2i}$ d) $-\frac{1}{2i}$
- 13) The residue of $\frac{1}{z^3 - z^5}$ at $z = \infty$ is
 a) 1 b) 0 c) -1 d) 2
- 14) If $f(z) = \frac{e^z}{z^2(z^2 + 9)}$ then residue of $f(z)$ at $z = 0$ is
 a) 1 b) $\frac{1}{9}$ c) $\frac{1}{2}$ d) $\frac{2}{3}$

2. Attempt **any seven** of the following :

14

1) Expand $f(z) = \frac{1}{(z+1)(z+3)}$ when $1 < |z| < 3$.

2) Define Isolated Essential singularity.

3) Let $f(z)$ be continuous a counter L of length l and let $|f(z)| < Ml$ then prove

that $\left| \int_L f(z) dz \right| \leq Ml$.



4) Find the residue of $\frac{1}{(z^2 + 1)^3}$ at $z = i$.

5) Find the nature of singularity of function $f(z) = \frac{1}{z(e^z - 1)}$.

6) Prove that $\frac{d}{dz}(f(z).g(z)) = f(z)\frac{d}{dz}g(z) + g(z).\frac{d}{dz}f(z)$.

7) Prove that $u = e^{-x} [(x^2 - y^2) \cos y + 2xy \sin y]$ is harmonic function.

8) Evaluate residue of $\frac{z^2}{(z-1)(z-2)(z-3)}$ at $z = 2, 3$ and ∞ .

3. A) Attempt **any two** of the following :

10

1) Explain Mittne Thomson's method of regular function.

2) Show that $\int_0^{2\pi} \frac{d\theta}{a + b\sin\theta} = \frac{2\pi}{\sqrt{a^2 - b^2}}$ if $a > b > 0$.

3) State and prove Cauchy's fundamental theorem.

B) If $\lim_{z \rightarrow a} (z-a)f(z) = A$ and if c is the arc $\theta_1 \leq \theta \leq \theta_2$ of the circle $|z-a| = r$ then

prove that $\lim_{r \rightarrow 0} \int_C f(z) dz = iA(\theta_2 - \theta_1)$.

4

4. Attempt **any two** of the following :

14

1) Show that $\int_0^\pi \frac{\cos 2\theta}{1 - 2a \cos \theta + a^2} = \frac{\pi a^2}{1 - a^2}$ (if $a^2 < 1$).

2) Show that $\sin \left(c \left(z + \frac{1}{z} \right) \right)$ can be expanded in a series of the type

$\sum_{n=0}^{\infty} a_n z^n + \sum_{n=0}^{\infty} b_n z^{-n}$ in which coefficient of both z^n and z^{-n} are

$$\frac{1}{2\pi} \int_0^{2\pi} \sin(2c \cos \theta) \cos n\theta d\theta.$$

3) Prove that the polar form of Cauchy Riemann equations $\frac{\partial u}{\partial r} = \frac{1}{r} \frac{\partial v}{\partial \theta}$ and

$$\frac{\partial v}{\partial r} = -\frac{1}{r} \frac{\partial u}{\partial \theta}.$$

where $r = \sqrt{x^2 + y^2}$, $\theta = \tan^{-1} \left(\frac{y}{x} \right)$



5. Answer **any two** of the following :

14

- 1) State and prove Cauchy Residue theorem.
 - 2) Evaluate $\int \bar{z} dz$ from $z = 0$ to $z = 4 + 2i$ along the curve L defined by
 - i) $z = t^2 + it$.
 - ii) The line from $z = 0$ to $z = 2i$ and then from $z = 2i$ to $z = 4 + 2i$.
 - 3) Prove that necessary and sufficient condition that $w = F(z) = u + iv$ be regular in region R is that C – R equations $u_x = v_y$ and $u_y = -v_x$ are sufficient in R where it is supposed that D is partial derivative continuous in R.
-



- v) In usual notations $V(\bar{y}_{st})_{Ney}$ is given by _____
- a) $\left(\frac{1}{n} - \frac{1}{N}\right) S^2$ b) $\frac{1}{n} \sum (P_i S_i)^2 - \frac{1}{N} \sum P_i S_i^2$
- c) $\frac{1}{n} \sum P_i S_i^2 - \frac{1}{N} \sum P_i S_i^2$ d) $\frac{1}{N} \sum (P_i S_i)^2 - \frac{1}{n} \sum P_i S_i^2$
- vi) The formula for sample size to be taken from each stratum by proportional allocation is due to _____
- a) Neyman b) Fisher c) Pearson d) Bowley
- vii) Non-response errors contribute to _____ errors.
- a) Non-sampling b) Sampling c) Random d) Standard
- viii) In stratified random sampling total number of distinct samples may be _____
- a) $\binom{N}{n}$ b) $\binom{N_i}{n_i}$ c) $\sum \binom{N_i}{n_i}$ d) None of these
- ix) Aggregate data on auxiliary variable is used in _____
- a) Two-stage sampling b) Ratio method
- c) Both a) and b) d) Neither a) nor b)
- x) Stratification is done in such a way that _____
- a) Units in each stratum are homogeneous
- b) Stratum variability is maximum
- c) Units in each stratum are heterogeneous
- d) Stratum means are minimum
- xi) Regression method of estimation will be efficient than ratio method if _____
- a) The regression of Y on X is linear and the intercept is zero
- b) The regression of Y on X is linear and the intercept is non-zero
- c) The regression of Y on X is not linear
- d) X and Y are independent



- xii) Sampling error can be reduced by _____
 - a) Selecting a sample of adequate size
 - b) Using suitable formula for estimation
 - c) Choosing proper sampling scheme
 - d) All of these
- xiii) When frame is not available and costly _____ sampling method can be effectively used.
 - a) Cluster
 - b) Two-stage
 - c) SRSWOR
 - d) Systematic
- xiv) Sampling frame is a list of sampling units that are _____
 - a) Exclusive
 - b) Exhaustive
 - c) Both a) and b)
 - d) Neither a) nor b)

2. Attempt **any seven** from the following : **14**

- a) State any two non-sampling errors.
- b) State the situation where stratified random sampling is superior to systematic sampling.
- c) State the expression for $V(\bar{y}_{st})$ in case of proportional allocation.
- d) State ratio estimator for population mean and population total.
- e) State any two characteristics of a good questionnaire.
- f) State any two situations where systematic sampling is applicable.
- g) State the formula for n_i i.e. the number of units to be selected from i^{th} stratum, in case of Neyman allocation.
- h) When do you go for sampling for attributes ?
- i) State an unbiased estimator for total number of units in the population possessing given attribute and its standard error.

3. A) Attempt **any two** from the following : **10**

- i) Describe ratio and regression methods of estimation.
- ii) Describe the method of determining the sample size in case of SRSWOR, so as to meet desired margin of error and confidence coefficient, stating the assumptions made.
- iii) What do you understand by proportional allocation ? Derive the expression for n_i i.e. the number of units to be selected from i^{th} stratum, in case of proportional allocation.

B) Show that ratio estimator is a biased estimator. Obtain expression for the bias. **4**



4. Attempt **any two** from the following : **14**
- A) Derive the expression for $V(\bar{y}_{sy})$ in terms of ρ , where $\rho =$ corr. Coeff. Between pairs of units that are in the same systematic sample. Obtain lower and upper bounds for ρ so that systematic sampling will be efficient than SRSWOR.
 - B) Establish the theoretical result which will justify the following statement “In a given stratum take a large sample if i) the stratum is larger and ii) stratum is more variable.” Obtain $V(\bar{y}_{st})$ using these n_i .
 - C) Show that $\bar{y}_{lr} = \bar{y}_n + b_0(\bar{X}_N - \bar{x}_n)$ is unbiased regression estimator for population mean. Find its variance and under certain condition to be stated w.r.t. b_0 find the minimum variance.
5. Attempt **any two** from the following : **14**
- A) Describe sampling for proportions and obtain unbiased estimator for population proportion also find its standard error.
 - B) Describe cluster sampling. Obtain an unbiased estimator for population mean and its variance.
 - C) Write a note on sampling and non-sampling error.
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B.Sc. – III (Semester – V) (New CGPA) Examination, 2017
GEOLOGY (Special Paper – VIII)
Geomorphology

Time : 2½ Hours

Max. Marks : 70

- Instructions:** 1) **All questions are compulsory.**
2) **Figures to the right indicate full marks.**
3) **Draw neat labelled diagrams wherever necessary.**

1. Fill in the blanks with correct answer from given options : **14**
- 1) The concept “The present is the key to the past” is given by
 - a) Steno
 - b) James Hutton
 - c) W.M. Davis
 - d) W.D. Thornbury
 - 2) Which of the following causes mass movement ?
 - a) $g_p + g + \text{shear strength} > g_t$
 - b) $g_p + g + \text{shear strength} < g_t$
 - c) $g_p < g + \text{shear strength} + g_t$
 - d) $g_p + g + \text{shear strength} = g_t$
 - 3) Choose the incorrect statement about Himalayan rivers.
 - a) Their tributaries are engaged in headward erosion
 - b) Pot holes are normal features
 - c) They are more sinuous and develop numerous meanders
 - d) Long profiles of rivers are characterized by rapids and water falls.
 - 4) No river can erode vertically beyond _____
 - a) Mean Sea Level
 - b) Local base level
 - c) Valley floor
 - d) Interfluvium
 - 5) The slope can be considered as stable when it has angle _____
 - a) 20° to 47°
 - b) 35° to 37°
 - c) 20° to 27°
 - d) 30° to 37°
 - 6) _____ is the only agent responsible for mass movement.
 - a) Water
 - b) Gravity
 - c) Slope
 - d) Weathering



- 7) Which of the following has indefinite surface of failure ?
a) Flowage b) Subsidence c) Sliding d) All of these
- 8) Which of the following type is stable at angle more than “angle of repose” ?
a) Dry sand b) Slightly wet sand
c) Sand saturated with water d) All of these
- 9) A high land between two streams known as _____
a) Point bars b) Spits c) Subtracts d) Drainage divide
- 10) In the old stage valley side shows _____ slope.
a) Convex b) Rectilinear
c) Concave d) Level to very gentle
- 11) Knick point can be indicated by presence of _____
a) Water fall b) Meandering c) Delta d) None of these
- 12) Elevation measured from mean sea level is _____
a) Relative relief b) Absolute relief
c) Initial relief d) None of these
- 13) Removal of upper deposition causes exposure of old landscape is known as _____ topography.
a) Exhumed b) Resurrected c) Both d) None of these
- 14) Alluvial fans and alluvial cones, meanders and loops and natural levees are characteristics of _____ stage in the fluvial evolution.
a) Youth b) Mature c) Old d) All of the above

2. Answer **any seven** of the following :

14

- i) What is multicyclic landscape ?
- ii) What is wanning slope ?
- iii) What is peneplain ?
- iv) What is rejuvenation ?
- v) What is lahar ?
- vi) Define mass wasting or mass movement.
- vii) What is angle of repose ?
- viii) What is soil creep ?
- ix) Ox-bow lakes and meandering are characteristics of which stage of development of river ?



3. A) Write short notes on **any two** of the following : **10**
- i) Explain in detail types of rapid flowage.
 - ii) What are characters of mature stage in cycle of erosion ?
 - iii) Explain dynamic rejuvenation.
- B) What is monitoring and control of mass movements ? **4**
4. Answer **any two** of the following : **14**
- i) Explain topographic expressions of rejuvenation.
 - ii) Describe slope elements in detail.
 - iii) Explain role of water in mass movement.
5. Answer **any two** of the following : **14**
- i) Explain in detail mature stage of river cycle.
 - ii) Describe quantitative classification of slopes.
 - iii) Describe effects of joints and bedding planes on mass movement.
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B.Sc. III (Semester – V) (New CGPA) Examination, 2017
MICROBIOLOGY
Industrial Microbiology (Special Paper – VIII)

Time : 2.30 Hours

Max. Marks : 70

N.B. : 1) All questions are compulsory.
2) Figures to the right indicate full marks.

1. Rewrite the following sentences by selecting correct answers from given alternatives.

14

- i) _____ is an example of hard cheese.
a) Cheddar b) Brick c) Roquefort d) Cottage
- ii) _____ is used as an antifoam agent in fermentation media.
a) HCl b) NaCl c) Octadecanol d) MgSO₄
- iii) Interferon produced by rDNA technology is an _____ product.
a) Antibacterial b) Antiviral c) Antifungal d) Antimalarial
- iv) _____ is waste from dairy industry.
a) Molasses b) CSL c) SWL d) Whey
- v) _____ enzyme is used for cheese production.
a) Amylase b) Caseinase c) Lipase d) Renin
- vi) _____ is symbiotic nitrogen fixer.
a) Rhizobium b) Azotobacter
c) Nitrobacter d) Nitromonas
- vii) Allergy testing of product is carried out on
a) Mice b) Cat c) Rabbit d) Monkey
- viii) Bitterness to beer is developed by addition of
a) Hops b) Malt c) Barley d) Adjuncts
- ix) Lysine production is carried out by using
a) B. Subtilis b) Proteus
c) Vibrio d) Corynebacterium glutamicum



- x) _____ wine does not contains CO₂.
a) Still b) Sparkling c) Dry d) Diabetic
- xi) Incubation period for streptomycin fermentation is _____ days.
a) 1 – 2 b) 2 – 3 c) 5 – 7 d) 10 – 12
- xii) _____ is used for bread production.
a) Algae b) Bacteria c) Yeast d) Protozoa
- xiii) Distillation is used for recovery of
a) Alcohol b) Streptomycin
c) L-lysine d) rDNA product
- xiv) Barley malt is used for production of
a) Wine b) Streptomycin c) Cheese d) Beer

2. Answer **any seven** of the following : **14**
- i) Define crude media.
 - ii) List organism in Idli fermentation.
 - iii) Types of cheese.
 - iv) Define screening media.
 - v) Types of beer.
 - vi) List organisms used for L-lysine production.
 - vii) Define starter culture.
 - viii) What is centrifugation ?
 - ix) What is precursor ?
3. A) Answer **any two** of the following : **10**
- i) Describe the tests for sterility of product.
 - ii) Spoilage of wine.
 - iii) Production of insulin by rDNA technology.
- B) Describe the bread production. **4**
4. Answer **any two** of the following : **14**
- i) Describe various raw material used for designing of fermentation media.
 - ii) Describe the production of bioinsecticides.
 - iii) Describe in detail streptomycin production.
5. Answer **any two** of the following : **14**
- i) Describe in detail production of grape wine.
 - ii) Describe the process of manufacture of cheese.
 - iii) Describe in detail production and applications of biofertilizers.
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B.Sc. – III (Semester – V) (CGPA Pattern) (New) Examination, 2017
ELECTRONICS (Special Paper – VIII)
Fundamentals of Communication

Time : 2½ Hours

Max. Marks : 70

- Instructions :** 1) Figures to the **right** indicate **full** marks.
2) Draw **neat** diagrams **wherever** necessary.
3) Use of log table and calculator is **allowed**.
4) **All** questions are **compulsory** and carry **equal** marks.

1. Select the correct alternative for the following : 14
- 1) Two way communication is called
a) Simplex b) Half duplex c) Full duplex d) Complex
- 2) The noise figure in radio receiver is the ratio of
a) $\frac{S/N \text{ input}}{S/N \text{ output}}$ b) S/N
c) $\frac{S/N \text{ output}}{S/N \text{ input}}$ d) N/S
- 3) For an ideal AM modulation index $m_a =$
a) 0 b) 1 c) > 1 d) < 1
- 4) The amplitude of modulating signal is 10 mv and that of carrier is 50 mv. The percentage modulation will be
a) 0.2 b) 20 c) 5 d) 50
- 5) Detection is used in
a) Transmitter b) Receiver
c) Both a) and b) d) None
- 6) The amount of frequency deviation from the center carrier frequency in FM is proportional to
a) Frequency b) Phase c) Amplitude d) All of these

P.T.O.



- 7) A half wave dipole of frequency of 100 MHz having length of
a) 100 m b) 3 m c) 1.5 m d) 0.75 m
- 8) The propagation of radiowaves near the surface of the earth is called _____ wave.
a) Ground b) Sky c) Space d) Radio
- 9) The D layer of the ionosphere occurs only during
a) Day time b) Night time c) Summer time d) Both a) and b)
- 10) The FM broadcast band is from
a) 550 to 1650 KHz b) 88 to 108 KHz
c) 16 to 45 MHz d) 88 to 108 MHz
- 11) The main purpose of interlacing in TV scanning to
a) Reduce flicker b) Brighter the TV picture
c) Sharpen the picture outline d) Increase the channel bandwidth
- 12) _____ colours are used in colour TV transmitter and receiver.
a) Red, Gray, Black b) Red, Green, Blue
c) Red, Gray, Blue d) Red, Green, Black
- 13) Incoming call can be directed to any other local telephone of our choice is called
a) Call queuing b) Call transfer c) Primary call d) Conference call
- 14) _____ is not an internal unit of telephone handset.
a) Hybrid b) Ringer
c) Transmitter and Receiver d) Local loop

2. Answer **any seven** for the following :

14

- 1) Define noise in communication. What are types of noise ?
- 2) What is need of modulation ?
- 3) List four benefits of SSB over DSB in AM.
- 4) What is line of sight communication ?
- 5) State the modulation used on video carrier and sound carrier in TV signal.



- 6) What is meant by skip distance ?
 - 7) Define directive gain and power gain for an antenna.
 - 8) Define viewing distance.
 - 9) What is FDM ?
 - 3. A) Answer **any two** : **10**
 - i) Discuss the different characteristics of radio receiver.
 - ii) Explain PWM technique used in digital communication.
 - iii) Explain interlaced scanning used in TV system.
 - B) Explain the operation of envelop detector using neat circuit diagram. **4**
 - 4. Answer **any two** : **14**
 - 1) Give principle of telephone and explain with suitable block diagram of telephone set.
 - 2) What are the different types of propagation of radiowave ? Explain propagation of radiowaves by ionospheric waves.
 - 3) Explain with block diagram the action of FM receiver.
 - 5. Answer **any two** : **14**
 - 1) Explain concept and block diagram of black and white television transmitter.
 - 2) Explain frequency modulation and derive mathematical expression for FM wave.
 - 3) Explain in detail Dish antenna used for receiver.
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**B.Sc. – III (Semester – V) (Computer Science) Examination, 2017
CORE JAVA (Special Paper No. – VIII)
(New CGPA Pattern)**

Time : 2.30 Hours

Total Marks : 70

Instructions : 1) **All** questions are **compulsory**.
2) Figures to the **right** indicate **full** marks.

1. Choose **correct** alternatives : **14**

1) Which will legally declare, construct and initialize an array ?

- a) `int[] myList = {"1", "2", "3"}`
- b) `int [] myList = (4, 5, 6)`
- c) `int myList [] [] = {8, 9, 10}`
- d) `int myList [] = {2, 5, 1}`

2) Which is a valid keyword in Java ?

- a) Interface
- b) String
- c) Float
- d) Unsigned

3) Java source files are compiled and converted to _____

- a) Object code
- b) Machine code
- c) Bytecode
- d) Executable file

4) Which of the following is a method having same name as that of its class ?

- a) Finalize
- b) Delete
- c) Class
- d) Constructor



- 12) Which of the following is true in the case of abstract class ?
 - a) Abstract constructors cannot be created
 - b) Abstract classes cannot be inherited
 - c) An abstract class contains only abstract methods
 - d) All of the above

- 13) Which is the super class of all exception classes ?
 - a) Exception
 - b) Object
 - c) Error
 - d) Throwable

- 14) Which of these interfaces define a method `itemStateChanged()` ?
 - a) `ComponentListener`
 - b) `ContainerListener`
 - c) `ActionListener`
 - d) `ItemListener`

2. Answer **any seven** of the followings : **14**

- 1) Explain in short any two adapter classes.
- 2) What is Java compiler ?
- 3) Structure of Java program.
- 4) What is throws keyword ?
- 5) What is Thread Priority ?
- 6) What is Event ?
- 7) What is Garbage Collection in Java ?
- 8) Short explanation of main method in Java.
- 9) Short explanation of `MouseListener`.

3. A) Attempt **any two** of the following : **10**

- 1) What is Dynamic Dispatch ? Give an example.
- 2) What is Layout ? Explain different types of layout in awt.
- 3) Explain uses of final keyword.

B) Write a program to design a frame to perform arithmetic operations (use Text Fields, Labels, Button).

4



4. Solve **any two**. **14**
- 1) Write a program to create custom exception in Java.
 - 2) Explain Applet Life Cycle.
 - 3) What is Thread ? Explain thread sychronization.
5. Solve **any two**. **14**
- 1) Write a program to design a frame to handle mouse related events.
 - 2) Explain the uses of Super keyword with an example.
 - 3) Explain ByteStream classes in Java.
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B.Sc. – III (Semester – V) (New) (CGPA) Examination, 2017
PHYSICS
Classical Mechanics (Special Paper – IX)

Time : 2½ Hours

Max. Marks : 70

- Instructions :** i) **All questions are compulsory.**
ii) Figures to the **right** indicate **full** marks.
iii) **Neat diagrams should be drawn wherever necessary.**
iv) **Use of log table and calculator is allowed.**

1. Select the correct answer from the given alternatives : 14
- 1) For a rigid body the distance between any two of its constituent particle is
a) Constant b) Infinite c) Unity d) Zero
- 2) The energy transfer from an oscillator to its coupled partner is periodic and takes place with the period $T =$
a) $\frac{\pi}{\omega_1 - \omega_2}$ b) $\frac{2\pi}{\omega_1 - \omega_2}$ c) $\frac{3\pi}{\omega_1 - \omega_2}$ d) $\frac{4\pi}{\omega_1 - \omega_2}$
- 3) In the rotational motion of a rigid body the directions of the angular velocity vector and the angular momentum vector are
a) Same b) Different
c) Antiparallel to each other d) At right angle to each other
- 4) If T and T_0 are time of flight of projectile in resistive medium and non resistive medium respectively then the relation between T and T_0 is
a) $T = T_0$ b) $T > T_0$ c) $T < T_0$ d) $T = \frac{1}{T_0}$
- 5) The Lagrangian function L is expressed as $L =$
a) $T + V$ b) T/V c) $T - V$ d) TV



- 6) A rigid body moving freely in space has _____ degrees of freedom.
a) 6 b) 9 c) 3 d) 4
- 7) When a particle moves through a force free space its _____ energy is zero.
a) Pressure b) Potential c) Kinetic d) Total
- 8) The part which deals with the motion of bodies without any reference to the force or forces causing the motion is called
a) Statics b) Dynamics c) Kinetics d) Kinematics
- 9) In a cyclon in northern hemisphere the wind whirls in the _____ direction.
a) Clockwise b) Opposite c) Anticlockwise d) Same
- 10) The maximum horizontal distance covered by a projectile is called the
a) Range of the projectile b) Altitude of the projectile
c) Flight of the projectile d) Trajectory of the projectile
- 11) A tower at the equator the horizontal displacement of the stone due to earth's rotation will be in _____ direction.
a) South b) North c) West d) East
- 12) If the amplitude of oscillations remains the same then the motion is called
a) Damped b) Overdamped c) Undamped d) Critically damped
- 13) The curve for which the surface of revolution is _____ called a catenary.
a) Maximum b) Minimum c) Same d) Extremum
- 14) The most general displacement of the rigid body is _____ about the same axis.
a) Translation plus vibration b) Translation plus rotation
c) Vibration plus rotation d) Translation plus axial

2. Answer **any seven** of the following :

14

- 1) What are constraints ?
- 2) What are the difficulties introduced by constraints in the mechanical problems ?
- 3) State Euler's theorem.
- 4) State Hamilton's principle.
- 5) Explain in short motion of rigid body in space.



- 6) State conservation theorem for energy of a particle.
 - 7) What is pseudo force ? Give one example.
 - 8) A particle of mass m moves under a force $F = - Cx^3$ where C is a positive constant. Find the potential energy function.
3. A) Answer **any two** of the following : **10**
- 1) Derive an expression for total energy of a system of two coupled pendulums.
 - 2) Show that shortest distance between two points in a plane is along a straight line.
 - 3) Prove the conservation theorem of angular momentum for a system of particles.
- B) What is coriolis force ? **4**
4. Solve **any two** of the following : **14**
- 1) Derive the Euler's equation of motion of rigid body.
 - 2) Derive an expression for two angular frequencies involved in the coupled oscillator.
 - 3) Show that the transit time of a particle from higher to lower point under the influence of gravity is minimum along a cycloid through the two points.
5. Solve **any one** of the following :
- 1) a) Obtain Lagrange's equation from D'Alemberts principle. **10**
b) Using Lagrange's equation obtain an expression for acceleration in the Atwood's machine. **4**
 - 2) a) Obtain an expression for angular acceleration of a particle in rotating co-ordinate system. **10**
b) Particles of masses 1 kg and 2 kg move under a force such that their position vectors at time 't' are $r_1 = 2\bar{i} + 4t^2\bar{k}$ and $r_2 = 4t\bar{i} + \bar{k}$ respectively. Find the angular momentum of the system about the origin at $t = 1$ s. **4**
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B.Sc. – III (Semester – V) (New CGPA) Examination, 2017
CHEMISTRY (Special Paper – IX)
Organic Chemistry

Time : 2½ Hours

Max. Marks : 70

- Instructions :**
- 1) **All questions are compulsory.**
 - 2) Draw **neat** labelled diagram and give equations **wherever necessary.**
 - 3) Figures to the **right** indicate **full marks.**
 - 4) Use of log table or calculator is **allowed.**
 - 5) Spectroscopic data is **supplied.**

1. Choose the correct alternative from each of the following : **14**
- i) For a non-linear molecule the number of fundamental modes of vibrations are calculated by relation
 - a) $3N - 6$
 - b) $3N - 2$
 - c) $3N - 5$
 - d) $3N - 7$
 - ii) According to Bayer's strain theory, deviation in cyclopropane is
 - a) $+9^{\circ}44'$
 - b) $+24^{\circ}44'$
 - c) $0^{\circ}44'$
 - d) $-5^{\circ}16'$
 - iii) Nuclei with an odd atomic mass and even or odd atomic number have
 - a) Zero spin
 - b) Integral spin
 - c) Half-integral spin
 - d) None of these
 - iv) In boat conformation of cyclohexane the flag pole hydrogen atoms are separated by _____ distance.
 - a) 1.56 \AA
 - b) 1.83 \AA
 - c) 2.31 \AA
 - d) 1.20 \AA
 - v) The peak arising due to reactions that occur outside the ionisation chamber but before the magnetic analyser of the mass spectrometer is known as
 - a) Isotope peak
 - b) Base peak
 - c) Molecular ion peak
 - d) Meta stable peak

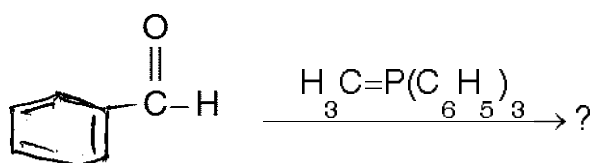


- vi) Among the following which base is used to carry out the Stobbe condensation ?
a) NaOH b) Pyridine c) NaH d) KOH
- vii) In mass spectrum, the intensity assigned to base peak is
a) 50% b) 70% c) 90% d) 100%
- viii) In NMR spectroscopy _____ radiations are used.
a) Ultra-violet b) Infra-red
c) Radio frequency d) Visible
- ix) Number of fundamental modes of vibrations in case of carbon dioxide are
a) 6 b) 3 c) 4 d) 9
- x) The reverse reaction of MPV reduction is known as
a) Oppenauer oxidation
b) Claisen condensation
c) Wittig reaction
d) Wagner-Meerwein rearrangement
- xi) Among the following which is reactive methylene compound ?
a) $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_3$ b) $\text{CH}_3\text{COCH}_2\text{COOC}_2\text{H}_5$
c) $\text{CH}_3\text{CH}_2\text{CH}_3$ d) $\text{H}_2\text{N}-\text{CH}_2\text{COOH}$
- xii) Hofmann rearrangement is _____ rearrangement.
a) Intramolecular b) Intermolecular
c) Both a) and b) d) None of these
- xiii) _____ conformer of methylcyclohexane is more stable.
a) Axial methyl cyclohexane
b) Equatorial methylcyclohexane
c) Both a) and b)
d) None of these
- xiv) Organozinc compound is formed as an intermediate in _____ reaction.
a) Reformatsky b) Wittig
c) Stobbe d) Hofmann



2. Solve **any seven** of the following : 14

- i) Explain basic principle of IR spectroscopy.
- ii) Explain pressional motion of the nuclei.
- iii) State the nitrogen rule. What is its importance in the determination of structure of molecule ?
- iv) Draw boat conformation and label the hydrogen as H_a, H_e, H_f and H_b.
- v) Complete the reaction and suggest the name.



- vi) Give the synthesis of ethyl 2, 2 dimethyl malonate.
- vii) How will you prepare β -amino pyridine from nicotinamide and β -alanine from succinamide ?
- viii) Define magnetic and non-magnetic nuclei.
- ix) Explain two types of stretching vibration.

3. A) Attempt **any two** of the following : 10

- i) Sketch the NMR spectrum of ethanol. How would you account for peaks in pure ethanol ?
- ii) What is meant by reactive methylene group ? How will you prepare butanoic acid from ethylacetoacetate ?
- iii) How will you distinguish between following pairs of compounds by IR spectroscopy ?
 - a) Methanol and acetic acid.
 - b) Benzyl alcohol and benzaldehyde.

B) Explain the use of mass spectroscopy in

- i) Determination of molecular formula.
- ii) Determination of molecular weight.



4. Answer **any two** of the following : **14**
- i) Write a note on applications of IR spectroscopy.
 - ii) Discuss the relative stabilities of conformations of methylcyclohexane with suitable diagrams.
 - iii) Discuss Reformatsky reaction with its mechanism. Give any two applications of Reformatsky reaction.
5. Answer **any two** of the following : **14**
- i) How will you prepare
 - a) alanine
 - b) β -methyl crotonic acid
 - c) barbituric acid from diethyl malonate.
 - ii) Explain Stobbe condensation with the help of suitable example and mechanism. Give any two applications of Stobbe condensation.
 - iii)
 - a) Explain spin-spin coupling.
 - b) Assign structure to the compound having following spectral data. Name the compound.
 - i) Molecular formula – C_7H_8O
 - ii) IR – 3500, 1600, 1500 cm^{-1}
 - iii) PMR – δ 3.7 (singlet 1H), 4.4 (singlet 2H), 7.2 (singlet 5H)



TABLE - 1
Characteristic Infrared Absorptions of Functional Groups

GROUP	FREQUENCY RANGE cm^{-1}	INTENSITY
A. Alkyl		
C - H (stretching)	2853-2962	(m - s)
Isopropyl - $\text{CH}(\text{CH}_3)_2$	1380 - 1385	(s)
tert - Butyl - $\text{C}(\text{CH}_3)_3$	and 1365 - 1370	(s)
	1385 - 1395	(m)
	and - 1365	(s)
B. Alkenyl		
C - H (stretching)	3010 - 3095	(m)
C = C (stretching)	1620 - 1680	(v)
R - CH = CH ₂	985 - 1000	(s)
	and 905 - 920	(s)
R ₂ C = CH ₂ (out of plane)	880 - 900	(s)
cis - RCH = CHR (C-H bendings)	675 - 730	(s)
trans - RCH = CHR	960 - 975	(s)
C. Alkynyl		
\equiv C - H (stretching)	- 3300	(s)
C \equiv C (stretching)	2100 - 2260	(v)
D. Aromatic		
Ar - H (stretching)	- 3030	(v)
Aromatic substitution type (C-H out-of-plane bendings)		
Monosubstituted	690 - 710	(very s)
	and 730 - 770	(very s)
o - Disubstituted	735 - 770	(s)
m - Disubstituted	680 - 725	(s)
	and 750 - 810	(very s)
p - Disubstituted	800 - 840	(very s)
E. Alcohols, Phenols, Carboxylic Acids		
OH (alcohols, phenols, dilute solutions)	3590 - 3650	(sharp v)
OH (alcohols, phenols, hydrogen bonded)	3200 - 3550	(broad s)
OH (carboxylic acids, hydrogen bonded)	2500 - 3000	(broad v)
F. Aldehydes, Ketones, Esters and Carboxylic Acids		
C = O stretch - 1720 { stre 2700 - 2900	1630 - 1780	(s)
aldehydes	1690 - 1740	(s)
ketones	1680 - 1750	(s)
esters	1735 - 1750	(s)
carboxylic acids	1710 - 1780	(s)
amides	1630 - 1690	(s)
G. Amines		
N - H	3300 - 3500	(m)
H. Nitriles		
C \equiv N	2220 - 2260	(m)



TABLE - 2
Approximate Proton Chemical Shifts in NMR

TYPE OF PROTON	CHEMICAL SHIFT, DELTA, PPM (δ)
1° Alkyl, RCH ₃	0.8 - 1.0
2° Alkyl, RCH ₂ R	1.2 - 1.4
3° Alkyl R ₃ CH	1.4 - 1.7
Allylic, R ₂ C = C - CH ₃ R	1.6 - 1.9
Benzylic, ArCH ₃	2.2 - 2.5
Alkyl chloride RCH ₂ Cl	3.6 - 3.8
Alkyl bromide, RCH ₂ Br	3.4 - 3.6
Alkyl iodide, RCH ₂ I	3.1 - 3.3
Ether, ROCH ₂ R	3.3 - 3.9
Alcohol, HOCH ₂ R	3.3 - 4.0
Ketone, RC(=O)CH ₃	2.1 - 2.6
Aldehyde, RCH(=O)H	9.5 - 9.6
Vinylic, R ₂ C = CH ₂	4.6 - 5.0
Vinylic R ₂ C = CH R	5.2 - 5.7
Aromatic, ArH	6.0 - 9.5
Acetylenic, RC \equiv CH	2.5 - 3.1
Alcohol hydroxyl, ROH	0.5 - 6.0 ^a
Carboxylic, RCO(=O)H	10 - 13 ^a
Phenolic, ArOH	4.5 - 7.7 ^a
Amino R-NH ₂	1.0 - 5.0

^aThe chemical shifts of these groups vary in different solvents and with temperature and concentration.

TABLE - 3

U.V. Absorption Rules for Diene Chromophores

- 1) Parent 215 nm
- 2) Each extra conjugation 30 nm
- 3) Homoannular 39 nm
- 4) Exocyclic double bond 05 nm
- 5) Each alkyl (R) substituent directly attached to double bonded carbon 05 nm

- OH, - OR, Cl, Br 5 (nm)
- SR, (30 nm)
- NR₂ (60 nm)

U.V. Absorption Rules for Enone System

- 1) Parent 215 nm
- 2) Each extra conjugation 30 nm
- 3) Homoannular 39 nm
- 4) Substituents
 - a) Alkyl group at α 10 nm
 - b) Alkyl group at β 12 nm
 - c) Alkyl group at γ, δ 18 nm

	α	β	γ
Cl	15	12	
OH, OR	35	30	
SR		85	
NR ₂		95	
O		75	
Acy!	6	6	6



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**B.Sc. – III (Semester – V) Examination, 2017
BOTANY – (Special Paper – IX) (CGPA) New
Genetics**

Time : 2.30 Hours

Total Marks : 70

- Instructions :** i) *All questions are compulsory.*
ii) *Draw neat labeled diagram wherever necessary.*
iii) *Figures to the right indicate full marks.*

1. Rewrite the following sentences by choosing the **correct** alternatives. **14**

- 1) Multiple alleles occupy the same locus within the _____ chromosome.
a) Homologous
b) Heterologous
c) Heterozygous
d) Homozygous
- 2) The dominant gene 'W' is stand for wild type of _____ eye color in *Drosophila*.
a) Red
b) Blood
c) Perl
d) White
- 3) Antigen _____ is present in B blood group.
a) A
b) B
c) AB
d) O
- 4) _____ propose that inheritance of A, B, AB, and O blood types of man in series of multiple three alleles.
a) Bern Stein
b) Land Steiner
c) Fisher
d) Wiener
- 5) Self incompatibility is observed in _____ plant.
a) Zea maize
b) *Nicotiana tobacum*
c) *Coffia arabica*
d) *Pisum sativum*

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- 6) The chromosomes which are related with determination of sex as a character are called _____
- a) Sex chromosomes b) Autosomes
c) Polysomes d) Polytene chromosomes
- 7) _____ chromosome is found in salivary glands of *Drosophila*.
- a) Giant b) Bended
c) Straight d) Flexible
- 8) _____ genes are present on non-homologous pair of 'Y' chromosome, which passed directly from father to son.
- a) Hologenic b) Diandric
c) Holandric d) Monadric
- 9) Colorblindness disease is an example of _____
- a) Jumping genes b) Autosomes
c) Sex linked genes d) None of these
- 10) The value of sex index (x/a) is in between 0.5-1.0 which gives _____
- a) Male b) Female
c) Inter sex d) Super male
- 11) The loss of one single chromosome creates a condition called _____
- a) Trisomy b) Nullisomy
c) Monosomy d) Haploid
- 12) Which of the cytoplasm is responsible for cytoplasmic inheritance ?
- a) Egg b) Sperm
c) Pollen d) None of these
- 13) Polytene chromosome first time observed by _____
- a) Balbiani b) Painter
c) Bridge d) Belling
- 14) A state or conditions of occurrence of more than two sets of chromosome in nucleus is called _____
- a) Monoploidy b) Diploidy
c) Polyploidy d) All of these



2. Answer **any seven** of the following : **14**
- 1) What are the autosomes ?
 - 2) What is nullisomy ?
 - 3) Define aneuploidy ?
 - 4) What are the multiple alleles ?
 - 5) What is difference between x and y chromosome ?
 - 6) What is the maternal inheritance ?
 - 7) Give the statement of Hardy-Winberg law.
 - 8) What are the holandric genes ?
 - 9) Enlist blood groups in man.
3. A) Attempt **any two** of the following : **10**
- 1) Describe the origin of aneuploidy.
 - 2) Describe mitochondrial inheritance.
 - 3) Describe in brief hemophilia in man.
- B) Blood groups in man. **4**
4. Attempt **any two** of the following : **14**
- 1) What is the sex determination ? Describe the mechanism of sex determination in man.
 - 2) What is maternal inheritance ? Explain it in plastids.
 - 3) Describe in brief Hardy-Winberg law in population genetics.
5. Attempt **any two** of the following : **14**
- 1) What is polyploidy ? Describe in brief types of polyploidy.
 - 2) What is the sex linked inheritance ? Describe in brief colorblindness in man ?
 - 3) Describe in brief multiple allelism in eye color of *Drosophila*.
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B.Sc. – III (Semester – V) (CGPA) Examination, 2017
ZOOLOGY (New) (Special Paper – IX)
Comparative Anatomy of Chordates

Time : 2.30 Hours

Max. Marks : 70

- Instructions:** 1) **All questions are compulsory.**
2) **Figures to the right indicate full marks.**
3) **Draw a neat labelled diagrams wherever necessary.**

1. Complete the sentence selecting appropriate answer : 14
- 1) Oily secretion produced by _____ glands, keeps the skin soft and leathery in mammals.
a) Scent b) Sweat c) Mucous d) Sebaceous
 - 2) Rhinocoel is present in _____
a) Olfactory lobe b) Optic lobe
c) Cerebellum d) Medulla Oblongata
 - 3) _____ is one of the contributory bone of pectoral girdle of vertebrates.
a) Pubis b) Scapula c) Ischium d) Ilium
 - 4) Mesonephros kidney is present in _____
a) Fish b) Reptiles c) Aves d) Amphibians
 - 5) Three chambered heart is found in _____
a) Fishes b) Amphibians c) Mammals d) Birds
 - 6) Horn of Rhinoceros is formed of modified _____
a) Scales b) Hairs c) Glands d) Muscles
 - 7) _____ of pigeon secrete pigeon milk.
a) Stomach b) Pancreas c) Crop d) Intestine
 - 8) Gills of _____ have filiform gill lamellae.
a) Cartilage fish b) Bony fishes
c) Ascidian tadpole d) Frog tadpole
 - 9) Gastric juice is secreted by _____
a) Intestinal gland b) Liver
c) Gastric gland d) Salivary gland
 - 10) Pecten is found in the eyes of _____
a) Birds b) Fishes c) Mammals d) Amphibians



- 11) Uropygial glands are present in _____
 a) Fishes b) Aves c) Reptiles d) Mammals
- 12) Corpora quadrigemina are seen in _____
 a) Fish b) Frog c) Rat d) Lizard
- 13) Lungs of pigeon are provided with _____ airsacs.
 a) Two b) Five c) Nine d) Ten
- 14) Down feather is present in _____
 a) Bony fish b) Rat c) Hen d) Frog

2. Answer **any seven** of the following : **14**
- i) Eye of rat
 - ii) Down feather
 - iii) Gills of cartilage fishes
 - iv) Heart of rat
 - v) Skin of rat
 - vi) Pelvic girdle of frog
 - vii) Brain of frog
 - viii) Mesonephros kidney
 - ix) Alimentary canal of frog.
3. A) Attempt **any two** of the following : **10**
- i) Give an account on lungs of birds.
 - ii) Give an account on Internal ear of Dog fish.
 - iii) Explain soft derivatives in mammals.
- B) Describe metanephros kidney. **4**
4. Attempt **any two** of the following : **14**
- i) Explain evolutionary changes in brain of fishes.
 - ii) Describe alimentary canal of frog.
 - iii) Give an account on respiratory organs in amphibia.
5. Attempt **any two** of the following : **14**
- i) Describe the evolution of aortic arches in vertebrates.
 - ii) Describe the evolution of kidney in vertebrates.
 - iii) Give an account on different types of feathers in birds.
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Seat
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B.Sc. – III (Sem. – V) (CGPA) (New) Examination, 2017
MATHEMATICS (Special Paper – IX)
Integral Calculus

Time : 2½ Hours

Max. Marks : 70

Instructions : 1) **All questions are compulsory.**
2) **Figures to the right indicate full marks.**

1. Choose the most correct alternatives for the following and rewrite the sentence : **14**

1) $\int_a^b \frac{dx}{(x-a)^p}$ is convergent if

- a) $p > 1$ b) $p = 1$ c) $p \geq 1$ d) $p < 1$

2) $\int_0^{\infty} \sin x \, dx$ is _____ integral.

- a) Improper integral of first kind b) Improper integral of second kind
c) Improper integral of third kind d) Proper integral

3) If $m > 0$, $n > 0$ then the integral $\int_0^1 x^{m-1} \cdot (1-x)^{n-1} dx$ is

- a) Convergent b) Divergent c) Oscillatory d) None of these

4) $\int_0^{\infty} e^{-x} \cdot x^{n-1} dx$ is convergent when

- a) $n > 0$ b) $n = 0$ c) $n < 0$ d) None of these

5) $\int_0^{2\pi} \tan x \, dx$ is an improper integral of

- a) First kind b) Second kind c) Third kind d) None of these



12) The value of $\sqrt{-\frac{3}{2}}$ =

- a) $-2\sqrt{\pi}$ b) $\frac{-8\sqrt{\pi}}{15}$ c) $\frac{4\sqrt{\pi}}{3}$ d) None of these

13) Value of $\int_0^{\infty} 4x^4 e^{-x^4} dx$ is

- a) $\sqrt{\frac{5}{4}}$ b) $\sqrt{\frac{3}{4}}$ c) $\sqrt{\frac{1}{4}}$ d) $2\sqrt{\frac{5}{4}}$

14) Value of $\int_0^2 (4-x^2)^{\frac{3}{2}} dx$ is

- a) π b) 2π c) 3π d) $\frac{\pi}{2}$

2. Solve **any seven** from the following :

14

1) Evaluate $\int_0^1 \int_{x^2}^{2-x} y dy dx$.

2) Evaluate $\int_0^{\pi} \int_0^{a(1+\cos\theta)} r dr d\theta$.

3) Evaluate $\int_0^2 \int_0^x \frac{dx dy}{x^2 + y^2}$.

4) Define Beta and Gamma function.

5) Show that $\beta(p, q) = \beta(q, p)$.

6) Evaluate $\int_0^{\pi/2} \sqrt{\cot \theta} d\theta$.

7) Define improper integrals of two kinds with suitable examples.

8) Test the convergence of $\int_1^{\infty} \frac{dx}{x^{2/3}(1+x)^{1/3}}$.

9) Evaluate $\int_{-\infty}^{\infty} \frac{dx}{(x^2 + 1)^2}$.



3. A) Attempt **any two** from the following : 10

1) Show that the improper integral $\int_0^{\infty} \frac{dx}{x^p}$ converges if and only if $p > 1$.

2) Show that $\beta(m,n) = \int_0^{\infty} \frac{y^{n-1}}{(1+y)^{m+n}} dy$.

3) Evaluate $\iint y \, dx \, dy$ over the area bounded by $y = x^2$ and $x + y = 2$.

B) Change the order of integration and evaluate $\int_0^5 \int_{2-x}^{2+x} dx \, dy$. 4

4. Attempt **any two** of the following : 14

1) Express in polar co-ordinates and evaluate $\int_0^{4a} \int_{y^2/4a}^y \left\{ \frac{x^2 - y^2}{x^2 + y^2} \right\} dx \, dy$.

2) Evaluate $\int_0^{\infty} e^{-ax} x^{m-1} \cos bx \, dx$ and $\int_0^{\infty} e^{-ax} x^{m-1} \sin bx \, dx$, $m > 0$.

3) If f and g are two positive functions with 'a' as point of singularity in $[a, b]$

such that $\lim_{x \rightarrow a^+} \frac{f(x)}{g(x)} = l$, where l is nonzero finite number then show that

$\int_a^b f(x) \, dx$ and $\int_a^b g(x) \, dx$ behaves alike.

5. Attempt **any two** from the following : 14

1) State and prove Dirichlet's test for convergence of improper integral of first kind.

2) State and prove Duplication formula for Gamma functions.

3) Using the transformation $x + y = u$, $x - y = v$, evaluate $\iint e^{\frac{x-y}{x+y}} dx \, dy$ over the region bounded by $x = 0$, $y = 0$, $x + y = 1$.



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B.Sc. (Part – III) (Semester – V) Examination, 2017
STATISTICS (Special Paper – IX) (New CGPA Pattern)
Probability Distributions and Stochastic Process

Time : 2½ Hours

Total Marks : 70

N.B. : i) **All questions are compulsory and carry equal marks.**
ii) **Use of scientific calculators and statistical tables is allowed.**

1. Choose most appropriate alternative.

14

i) If X is Cauchy (10, 20) then $Q_3 =$

- a) 10 b) 30 c) 20 d) none of these

ii) For Cauchy distribution coefficient of skewness γ_1

- a) is positive b) is negative
c) is equal to 0 d) does not exist

iii) If a r.v. X is truncated below 5 then $P(|X| < 5) =$

- a) $2P(X < 5)$ b) $P(X > 5)$ c) 1 d) 0

iv) Mean of truncated binomial distribution truncated at $X = 0$ is

- a) $\frac{np}{q}$ b) $\frac{np}{q^n}$ c) $\frac{np}{1-q^n}$ d) np

v) For Laplace distribution

- a) $\beta_1 = 0, \beta_2 = 6$ b) $\beta_1 = 0, \beta_2 = 3$
c) $\beta_1 > 0, \beta_2 > 6$ d) $\beta_1 < 0, \beta_2 = 3$

vi) If $X \rightarrow \text{Laplace}(\mu, \lambda)$ with p.d.f. $f(x) = \frac{\lambda}{2} e^{-\lambda|x-\mu|}$ $0 \leq \lambda, |\mu|, |x|$; then $E(X-\mu)^3$ is

- a) $2\lambda^2 + \mu$ b) $2\mu^2 + \lambda$ c) $2\lambda^2 - \mu$ d) none of these

P.T.O.



vii) A stochastic matrix is

- a) a square matrix with no negative elements
- b) column sums add up to 1
- c) diagonal elements always add up to 1
- d) none of these

viii) If P denotes one step T.P.M. then 4 step T.P.M. is given by

- a) $4P$
- b) $(P^2)^3$
- c) P^4
- d) P^{-4}

ix) In stochastic process the state space may be

- a) discrete
- b) continuous
- c) a and b
- d) a or b

x) Let (X, Y) is BN $(0, 0, \sigma_1^2, \sigma_2^2, \rho)$ and suppose $U = \frac{X}{Y}$ and $V = Y$ then the marginal distribution of V is

- a) Cauchy
- b) Normal
- c) Lognormal
- d) Laplace

xi) Let (X, Y) is BN $(1, 2, 3, 4, 0)$ then $P(3 < x < 8 | Y > 5) =$

- a) $P[(3 < x < 8) \cap (Y > 5)]/P(3 < x < 8)$
- b) $P(3 < x < 8)$
- c) $P[(3 < x < 8) \cap (Y > 5)]$
- d) $P[(3 < x < 8) \cup (Y > 5)]$

xii) Let (X, Y) is BN $(3, 2, 4, 9, 0.5)$ then $\text{Cov}(X, Y) =$

- a) 1
- b) 18
- c) 3
- d) none of these

xiii) Let X is LN $(0, 1)$ r.v. then $V(\log X + k) =$

- a) $e(e - 1)$
- b) $e(e + 1)$
- c) e
- d) 1

xiv) If X is LN (μ, σ^2) then $P(X = Q_2)$ is =

- a) 0
- b) 1
- c) 0.5
- d) e^{-1}



2. Attempt **any seven** from the following : 14

- a) State the relationship between Cauchy and student t distribution.
- b) Define absorbing state.
- c) State Chapman Kolmogrov equation.
- d) Obtain the p.d.f. of truncated exponential (1) r.v., truncated below θ .
- e) If X is $C(\mu, \lambda)$ write expressions for quartile deviation.
- f) Draw a probability curve for $C(\mu, \lambda)$ distribution.
- g) If X is $L(\mu, \lambda)$ find μ_r when r is odd.
- h) Let (X, Y) is BN (2, 4, 6, 8, 0.8) then write the expressions for $E[X^2]$ and $E[XY]$.
- i) Let (X, Y) is BN $(\mu_1, \mu_2, \sigma_1^2, \sigma_2^2, \rho)$ then write the distribution of $aX + bY + c$.

3. A) Attempt **any two** from the following : 10

i) Write down the one step TPM for the following Markov chain :

Following are the dietary habits of a creature who eats only grapes, cheese or lettuce with following rules

- It eats exactly once a day
- If it ate cheese today, tomorrow it will eat lettuce or grapes with equal probability
- If it ate grapes today, tomorrow it eats grapes with probability 0.1 and cheese with probability 0.6
- If it ate lettuce today, tomorrow it will eat grapes with probability 0.4 and cheese with probability 0.6

ii) Let X is LN $(\mu, \sigma)^2$ then find the distribution of $\left(\frac{1}{X}\right)$.

iii) Define $L(\mu, \lambda)$ distribution and find its mean.

B) Find the p.d.f. of truncated normal distribution, truncated below a and find its mean.



4. Attempt **any two** from the following : **14**
- A) If X is $C(0, 1)$ r.v. then find the distribution of X^2 .
 - B) Suppose the probability that a dry day (state 0) following a rainy day (state 1) is $1/3$ and that the probability of rainy day following a dry day is 0.5 . Find the probability that June 29 is a rainy day given that June 27 was a dry day.
 - C) Let (X, Y) is $BN(\mu_1, \mu_2, \sigma_1^2, \sigma_2^2, \rho)$ then find its mgf.
5. Attempt **any two** from the following : **14**
- A) If X is $L(\mu, \lambda)$ show that $KX + C$ is $L\left(K\mu, \frac{\lambda}{K}\right)$.
 - B) State and prove relationship between Cauchy and uniform distribution.
 - C) Let X is $LN(\mu, \sigma)^2$ then find its CDF and hence median.
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Seat No.	
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B.Sc. – III (Semester – V) (New CGPA) Examination, 2017
GEOLOGY (Special Paper – IX)
Environmental Geology

Time : 2½ Hours

Max. Marks : 70

Instructions : 1) **All questions are compulsory.**
2) **Figures to the right indicate full marks.**
3) **Draw neat labelled diagrams wherever necessary.**

1. Fill in the blanks with correct answer from given options : **14**
- 1) Increased temperature of spring water is indicator of _____ hazard.
a) Volcano b) Cyclone c) Landslide d) Flood
 - 2) Slides are more likely where rock layers dip _____
a) Parallel to slope b) Into the slope
c) Steeply d) Gently
 - 3) The main effect of human activities that produces sinkhole collapse is _____
a) Vibrations from highways b) Increasing runoff by paving
c) Lowering the water table d) Removing vegetation
 - 4) Low porosity and permeability of sediments covered with vegetation on slope promotes _____
a) Stability to mass b) Transpiration
c) Sure slide d) Subsidence
 - 5) Which of the following methods can reduce subsidence associated with underground mining ?
a) Make sure that at least 10 m of hard rock overlies the mine
b) Make rooms wider to reduce amount of vibration associated with digging
c) Use grout columns
d) All of the above



- 6) Which of the following means of stabilizing slopes does so by reducing the shear stress ?
- a) Draining the subsurface b) Installing piles
c) Reducing the slope angle d) Increasing slope angle
- 7) The most destructive landslides generally occur on _____
- a) Gentle slopes b) Intermediate slopes
c) Steep slopes d) Leveled ground
- 8) Gabian structure reduces hazard of _____
- a) Cyclone b) Tsunami c) Landslide d) Volcano
- 9) Fire is common hazard in _____ mining.
- a) Gold b) Iron c) Coal d) Asbestos
- 10) Disposal of _____ is main problem in open cast mining.
- a) Ore b) Dump c) Mineral d) Heavy machinery
- 11) The solid material falls down under influence of gravity in _____ hazard.
- a) Volcano b) Landslide c) Tsunami d) Flood
- 12) Sinkhole collapse in karst areas commonly occurs because of _____
- a) Collapse of cavern roofs
b) Collapse of supporting materials over a cavity
c) Rapid solution of limestone near the surface
d) Temperature
- 13) Deafness is caused due to _____ in mines.
- a) Ground water b) Fire c) Roof collapse d) Blasting
- 14) Artillery firing activity in Military range present in mountainous regions may trigger _____
- a) Remote sensing cameras b) Platforms
c) Objects d) Sensors

2. Answer **any seven** of the following :

14

- 1) Role of Mangroves in hazard prevention.
- 2) Explain Fluorosis.
- 3) Explain Bolting.
- 4) Explain Asbestosis.



- 5) Explain Retention Wall.
 - 6) Hazards of gaseous products of volcano.
 - 7) Explain Hazard.
 - 8) What is mitigation ?
 - 9) What is preparedness ?
3. A) Answer **any two** of the following : **10**
- 1) Water contamination due to mining activity.
 - 2) Hazard due to heavy machinery in mining activity.
 - 3) Hazard due to blasting in mining activity.
- B) Hazardous effects of Tsunami and Cyclone. **4**
4. Answer **any two** of the following : **14**
- 1) Effects of sea level changes.
 - 2) Causes of subsidence.
 - 3) Natural causes of sea level changes.
5. Answer **any two** of the following : **14**
- 1) Role of vegetation in flood and landslide hazards.
 - 2) Hazard of fire in coal mining.
 - 3) Precautions of volcanic hazard.
-



- viii) The percentage of CO₂ in the atmosphere is _____
a) 21% b) 0.2% c) 5% d) 0.03%
- ix) Oilyspots on pomegranate are caused by member of _____
a) Bacillus b) Xanthomonas
c) Erwinia d) Pseudomonas
- x) _____ is the symbiotic N₂ fixer.
a) Azotobacter b) Penicillium
c) Frankia d) Bacillus
- xi) In Farm Yard Manure the proportion of cattle dung and urine is _____
a) 3 : 1 b) 1 : 1 c) 2 : 1 d) 1 : 2
- xii) Bordeaux mixture contain _____, lime and water.
a) Silver nitrate b) Copper sulphate
c) Calcium carbonate d) Magnesium sulphate
- xiii) Melting of ice caps is due to _____
a) Depletion of ozone
b) Green house effect
c) Acid rain
d) Eutrophication
- xiv) The importance of ecosystem lies in _____
a) Flow of energy
b) O₂ production
c) CO₂ production
d) Bacterial degradation

2. Answer **any seven** of the following :

14

- i) What is nitrification ?
- ii) Common symptoms of soft rot of potato.
- iii) List pesticide degrading microorganisms.
- iv) Define plant pathology.
- v) What is composition of farm yard manure ?
- vi) What is canker ?
- vii) What are the sources of sulphur in atmosphere ?
- viii) Give significance of vermicompost.
- ix) Give reaction of cellulose degradation.



3. A) Answer **any two** of the following : **10**
- i) Explain use of Bordeaux mixture for control of plant diseases.
 - ii) Explain biological nitrogen fixation.
 - iii) Explain structure and properties of soil.
- B) Write a note on modes of transmission of plant diseases. **4**
4. Answer **any two** of the following : **14**
- i) Write an essay on carbon cycle.
 - ii) Write an essay on town compost.
 - iii) Write an essay on role of soil microorganisms.
5. Answer **any two** of the following : **14**
- i) Write an essay of green manure.
 - ii) Write in brief 'soil as an ecosystem'.
 - iii) Discuss in detail causative agent, symptoms and control of oily spots of pomegranate.
-



- ix) In the instruction MUL AB, after execution, the high order and low order bytes are present in
- a) PSW and PCON b) Stack memory
c) A and B registers d) Registers R0 and R1
- x) _____ instruction in μ C 8051 represents unconditional absolute jump.
- a) SJMP b) DJNZ c) AJMP d) CJNE
- xi) _____ is the pin used for serial data transmission.
- a) RxD b) TxD c) INT0 d) INT1
- xii) μ C 8051 supports _____ mode of serial communication.
- a) Simplex b) Half Duplex c) Full Duplex d) None of these
- xiii) The number of address lines required to interface μ C 8051 to EPROM 2764 is _____
- a) 10 b) 11 c) 12 d) 13
- xiv) The instruction used to access the data from external data memory ROM like 6264, is _____
- a) MOV b) MOVX c) MOVC d) all of these

2. Answer **any seven** of the following :

14

- i) Enlist different addressing modes.
- ii) Draw any four symbols for flow chart.
- iii) Enlist any four SFR.
- iv) Write different instructions for Addition.
- v) Why PORT-0 needs external pull-up ?
- vi) Write instructions to copy data from bank register R1 to internal RAM address 35 H.
- vii) How $\overline{\text{PSEN}}$ signal is used in memory interfacing ?
- viii) At which internal RAM address result of following instructions will be obtained
- a) SETB 07
b) CLR 17
- ix) Give the role of ALE.



3. A) Answer **any two** : **10**
- i) Draw the block diagram of μ C 8051.
 - ii) Draw CLOCK circuit for μ C 8051 and explain.
 - iii) Explain the role of SCON register in serial communication.
- B) Write an Assembly Language Program to generate square wave at port pin P1.0. **4**
4. Answer **any two** : **14**
- i) Draw the pin distribution diagram of μ C 8051.
 - ii) Write an Assembly Language Program to transfer ten bytes of data from one memory block to another memory block.
 - iii) With neat diagram explain the interfacing of EPROM 2764 to μ C 8051.
5. Answer **any two** : **14**
- i) Discuss Data transfer group of instructions with suitable example.
 - ii) What are different types of jump instructions ? Explain the relative address system for jump instructions with suitable example.
 - iii) Write the Assembly Language Program to execute AND, OR, EX-OR operation on data stored in memory 20 H and 21 H. The answers will be in 22 H, 23 H and 24 H internal RAM.
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Seat No.	
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B.Sc. (Part – III) (Semester – V) Examination, 2017
(New CGPA Pattern)
COMPUTER SCIENCE
Operating System – I (Special Paper No. – IX)

Time : 2½ Hours

Total Marks : 70

Instructions : 1) Figures to the **right** indicate **full** marks.
2) **All** questions are **compulsory**.

1. Choose and write correct answer from given **four** alternatives. **14**
- 1) In a time-sharing operating system, when the time slot given to a process is completed, the process goes from the running state to the
 - a) Blocked state
 - b) Ready state
 - c) Suspended state
 - d) Terminated state
 - 2) The process that are residing in the main memory and are waiting to execute are kept on a list called
 - a) job queue
 - b) ready queue
 - c) wait queue
 - d) device queue
 - 3) In memory management, a technique called as paging, the physical memory is broken into fixed sized blocks called
 - a) pages
 - b) frames
 - c) blocks
 - d) segments
 - 4) Virtual memory is
 - a) An extremely large main memory
 - b) An extremely large secondary memory
 - c) An illusion of extremely large main memory
 - d) A type of memory used in supercomputers
 - 5) The mechanism that bring a page into memory only when it is needed is called
 - a) Segmentation
 - b) Fragmentation
 - c) Demand paging
 - d) Page Replacement

P.T.O.



- 6) In a multi-programming environment
- a) the processor executes more than one process at a time
 - b) the programs are developed by more than one person
 - c) more than one process resides in the memory
 - d) a single user can execute many programs at the same time
- 7) Which of the following is an example of spooled device ?
- a) The terminal used to enter the input data for a program being executed
 - b) The secondary memory device in a virtual memory system
 - c) A line printer used to print the output of a number of jobs
 - d) None of these
- 8) When a process terminates
- i) It is removed from all queues
 - ii) It is removed from all, but the job queue
 - iii) Its process control block is deallocated
 - iv) Its process control block is never deallocated
- a) Both i and iii b) Both i and ii c) Only iv d) Only ii
- 9) Safe state is
- a) deadlock state
 - b) non-deadlocked state
 - c) polling state
 - d) spooling state
- 10) Semaphore can be used for solving
- a) wait and signal
 - b) deadlock
 - c) synchronization
 - d) priority
- 11) To access the services of operating system, the interface is provided by the
- a) system calls
 - b) API
 - c) library
 - d) assembly instructions
- 12) Which scheduler controls the degree of multiprogramming ?
- a) Short term scheduler
 - b) Long term scheduler
 - c) Middle term scheduler
 - d) Pre term scheduler



- 13) As OS program module that selects the next job to be admitted for execution is called as
a) scheduler b) compiler c) throughput d) dispatcher
- 14) The code that changes the value of the semaphore is
a) remainder section code b) non critical section code
c) critical section code d) none of these

2. Solve **any seven** of the following. **14**

- 1) What do you mean by best fit and first fit ?
- 2) Define mutual exclusion and circular wait.
- 3) What is process control block ?
- 4) What is Compaction ?
- 5) What is resource allocation graph ?
- 6) What are threads ? Its types.
- 7) What is Operating System ?
- 8) What is TLB and Hit-Ratio ?
- 9) What is meant by External Fragmentation and Internal Fragmentation ?

3. A) Attempt **any two** of the following. **10**

- 1) Explain distributed and multiprocessor operating system.
- 2) Explain process scheduling concept.
- 3) Explain cooperating process with message passing and shared memory.

B) Consider the following page reference string. **4**

1, 2, 7, 8, 3, 4, 2, 1, 4, 2, 5, 6. How many page fault would occur for the following page replacements algorithms, assuming an allocation of 3 frames ?
By using FIFO.

4. Attempt **any two** of the following. **14**

- 1) Explain different services provided by operating system.
- 2) Discuss various deadlock detection and recovery techniques in brief.
- 3) Explain demand paging.



5. Attempt **any two** of the following.

14

- 1) Explain the basic concepts of segmentation.
- 2) Discuss classical problem of synchronization for Reader Writer problem.
- 3) Consider the following example

Process	Execution time
P1	19
P2	7
P3	5

To solve by using FCFS scheduling Algorithm

- a) Draw Gantt Chart
 - b) To calculate average waiting time
 - c) To calculate average turnaround time.
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Seat No.	
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**B.Sc. (Part – III) (Semester – V) Examination, 2017
PHYSICS (Special Paper – X) (CGPA Pattern) (New)
Nuclear Physics**

Time : 2 ½ Hours

Max. Marks : 70

- Instructions:** i) **All questions are compulsory.**
ii) Figures to the **right** indicates **full** marks.
iii) **Neat** diagrams must be drawn **wherever** necessary.
iv) **Use** of log table or calculator is **allowed**.

1. Select the correct alternative :

14

- 1) Betatron works on principle of _____
 - a) ionization
 - b) transformer
 - c) induction coil
 - d) condensation
- 2) In cyclotron resonance condition breaks due to relativistic _____
 - a) increase in velocity
 - b) increase in mass
 - c) decrease in mass
 - d) decrease in velocity
- 3) The GM counter works on the principle of _____
 - a) ionization
 - b) light sensing
 - c) photoelectric effect
 - d) bubble formation
- 4) The element having same mass number but different atomic number are called _____
 - a) isotopes
 - b) isobars
 - c) isomers
 - d) isotropic
- 5) The energy equivalent to 1 amu = _____
 - a) 931 MeV
 - b) 831 MeV
 - c) 921 MeV
 - d) 731 MeV
- 6) The liquid used in bubble chamber must be _____
 - a) non-conducting
 - b) highly conducting
 - c) semi-conducting
 - d) super conducting



- 5) What is stripping reaction ?
 - 6) Explain continuous β -ray spectrum.
 - 7) What are types of interactions ?
 - 8) What is pick up reaction ?
3. A) Attempt **any two** of the following : **10**
- 1) Explain α -ray spectra.
 - 2) Explain binding energy curve.
 - 3) Obtain equation for threshold energy of nuclear reaction.
- B) Calculate Q-value of the following reaction and indicate type of reaction. **4**
- $${}_2\text{He}^4 + {}_7\text{N}^{14} \longrightarrow {}_8\text{O}^{17} + {}_1\text{H}^1$$
- Given : mass of ${}_2\text{He}^4 = 4.0038727$ a.m.u.
Mass of ${}_7\text{N}^{14} = 14.003074$ a.m.u.
Mass of ${}_8\text{O}^{17} = 16.999133$ a.m.u.
Mass of ${}_1\text{H}^1 = 1.007825$ a.m.u.
4. Attempt **any two** of the following : **14**
- a) Explain classification of elementary particles.
 - b) Explain liquid drop model of nucleus.
 - c) What is β -decay ? Explain the experimental study of β -decay.
5. A) Explain construction and working of GM counter. Explain Geiger Plateau, dead time and recovery time. **10**
- B) Explain principle of phase stable orbit. **4**
- OR
5. A) Describe construction and working of cyclotron. Obtain equation of velocity of ion in cyclotron. **10**
- B) Write note on cross section of nuclear reaction. **4**
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Seat No.	
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B.Sc. (Part – III) (Semester – V) (New CGPA) Examination, 2017
CHEMISTRY (Special Paper – X)
Analytical and Industrial Physical Chemistry

Time : 2½ Hours

Total Marks : 70

- Instructions :** 1) **All questions are compulsory.**
2) **Draw neat diagram and give equations wherever necessary.**
3) **Figures to the right indicate full marks.**

1. Choose the most correct alternative of the following and rewrite the sentences. **14**
- 1) If ultraviolet light is used then vessels and other optical parts of the colorimeter are made up of _____
a) plastic b) glass c) ebonite d) quartz
 - 2) In potentiometric titration, the potential of the electrode changes due to change in _____
a) ionic concentration b) pressure
c) temperature d) volume
 - 3) The conductivity water is obtained by redistillation of distilled water with alkaline _____
a) NaOH b) KOH c) KMnO₄ d) HCl
 - 4) In the equation, $\lambda = hc / E_2 - E_1$, where h is known as _____
a) Gas constant b) Planck's constant
c) Boltzmann constant d) Rydberg's constant
 - 5) Generally _____ of the metal to be deposited is used during electroplating.
a) Insoluble cathode b) Soluble anode
c) Soluble cathode d) Insoluble anode
 - 6) In a calorimeter, the reciprocal of thickness 'x' required to reduce the light to 1/10th of its intensity is known as _____
a) Extinction coefficient
b) Specific extinction coefficient
c) Molecular extinction coefficient
d) All of these



- 7) In aqueous solution, quinhydrone breaks into equimolecular quantities of _____
- quinone and hydroquinone
 - quinone and quinhydrone
 - quinone and acetone
 - quinone and hydrocarbon
- 8) For measurement of conductance, an alternating current source having audio frequency range _____ cycles per second is used.
- 20 – 50
 - 200 – 500
 - 500 – 2000
 - 2000 – 5000
- 9) In a flame photometry, the measurement of concentration of metals relatively _____ intensity of radiation is obtained from the metal atoms.
- Low
 - High
 - Zero
 - None of these
- 10) The process of removal of oxide or dust on the article by the action of mineral acids like HCl, H_2SO_4 and HNO_3 is known as _____
- electrolysis
 - electrophoresis
 - anodising
 - pickling
- 11) The weights of the substances deposited are depends on the _____ efficiencies.
- cathode
 - anode
 - cathode and anode
 - None of these
- 12) Optical density at unit path length and unit concentration is known as _____
- Specific extinction coefficient
 - Absorbency index
 - Absorptivity
 - All of these
- 13) The glass electrode is made up of a special glass of relatively low melting point and _____
- Low electrical conductivity
 - High electrical conductivity
 - Low ionic conductivity
 - None of these
- 14) The molecular conductance (μ) of the solution is given by $\mu =$ _____
- $1000 \times M/k$
 - $1000 \times k/M$
 - $100 \times k/M$
 - $100 \times M/k$



2. Solve **any seven** of the following : **14**
- 1) Define Beer's law.
 - 2) Give the advantages of glass electrode.
 - 3) Represent the nature of graph for determination of end points by first derivative method.
 - 4) Draw basic circuit of direct reading potentiometer.
 - 5) Why alternating current is used in conductometric measurements ?
 - 6) Give the principle of conductometric titration.
 - 7) What do you mean by anode efficiency ?
 - 8) What are the difficulties arises in qualitative analysis of flame photometry ?
 - 9) Give the advantages of Lundergraph burner.
3. A) Write notes on **any two** of the following : **10**
- 1) Causes of deviations from Beer's law.
 - 2) Potentiometric acid-base titrations.
 - 3) Laminar flow burner.
- B) Solve the following : **4**
- Cleaning of articles in electroplating.
4. Attempt **any two** of the following : **14**
- 1) Discuss in detail barrier layer photocell.
 - 2) Sketch and explain the different types of conductivity cells.
 - 3) Discuss the general principle of flame photometry.
5. Attempt **any two** of the following : **14**
- 1) Describe construction and working of quinhydrone electrode.
 - 2) Give different types of conductometric titrations. Discuss conductometric titration between HCl and NaOH.
 - 3) Describe bright nickel plating. Give its applications.
-



- vii) Define saturated fatty acids.
- viii) Any four chemical properties of polysaccharide.
- ix) Secondary structure of protein.

3. A) Attempt **any two** of the following : **10**

- i) Explain essential amino acids with example.
- ii) Explain properties of saturated fatty acid.
- iii) Describe Maltose and their properties.

B) Describe tertiary structure of protein. **4**

4. Attempt **any two** of the following : **14**

- i) Describe the biosynthesis of sucrose.
- ii) Explain the protein synthesis in prokaryotes.
- iii) Write a note on gluconeogenesis.

5. Attempt **any two** of the following : **14**

- i) What is lipids ? Describe classification of lipid with example.
 - ii) Explain the degradation of starch.
 - iii) Brief outline of protein synthesis in eukaryotes.
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Seat No.	
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B.Sc. (Part – III) (Semester – V) (CGPA) (New) Examination, 2017
ZOOLOGY (Special Paper – X)
Developmental Biology

Time : 2½ Hours

Max. Marks : 70

- Instructions:** 1) **All questions are compulsory.**
2) **Figures to the right indicate full marks.**
3) **Draw neat labelled diagrams wherever necessary.**

1. Select appropriate answer from each of the following and rewrite the sentences. **14**

- 1) The process of formation of sperm is called as
 - a) Oogenesis
 - b) Spermatogenesis
 - c) Ovulation
 - d) Fertilization
- 2) The egg of chick is
 - a) A lecithal
 - b) Homolecithal
 - c) Macrolecithal
 - d) Isolecithal
- 3) After fertilization the vitelline membrane of egg is converted into _____ membrane.
 - a) Basement
 - b) Plasma
 - c) Extra embryonic
 - d) Fertilization
- 4) The egg shell of chick embryo is made up of
 - a) Calcium carbonate
 - b) Glycoprotein
 - c) Protein
 - d) Carbohydrate
- 5) The embryo of about 72 hrs, incubation shows presence of _____ pairs of somites.
 - a) 12
 - b) 36
 - c) 20
 - d) 15
- 6) Determinate type of cleavage is also called as _____ cleavage.
 - a) Irregular
 - b) Regular
 - c) Mosaic
 - d) Superficial
- 7) Major nutritive foetal membrane in chick embryo is
 - a) Amnion
 - b) Chorion
 - c) Allantois
 - d) Yolk sac



- 8) Chalazae in hen's egg are useful
- To keep the ovum in centre
 - For development of ectoderm
 - For development of mesoderm
 - For development of endoderm
- 9) The smallest spermatozoan is found in
- Human
 - Amphioxus
 - Chick
 - Frog
- 10) Placenta is found in
- Birds
 - Fishes
 - Mammals
 - Aves
- 11) In Amphioxus, neurogenesis is the process of formation of
- Coelom
 - Notochord
 - Gut
 - Nerve cord
- 12) _____ of chick embryo is called primitive knot.
- Hensen's node
 - Cephalic fold
 - Neural arch
 - Somite
- 13) Somites of chick embryo develop into
- Lungs
 - Endoskeleton
 - Gut
 - Kidney
- 14) Acrosome of sperm is responsible for _____ during fertilization.
- Maturation of sperm
 - Migration of sperm
 - Piercing vitelline membrane
 - Carry the haploid nucleus

2. Answer **any seven** of the following :

14

- Fertilization membrane.
- Primitive streak.
- Somites in chick.
- Structure of sperm.
- Grey crescent.
- Cleidoic egg.
- Blastula of Amphioxus.
- Centrolecithal egg.
- Internal fertilization.



3. A) Attempt **any two** of the following : **10**
- 1) Structure of Hen's egg.
 - 2) Fertilizin and antifertilizin reaction.
 - 3) Gut formation in amphioxus.
- B) Describe significance of foetal membranes. **4**
4. Attempt **any two** of the following : **14**
- 1) Describe heart formation in chick embryo.
 - 2) What is placenta, describe any one type of placenta.
 - 3) Describe different types of cleavages.
5. Answer **any two** of the following : **14**
- 1) Describe the chick embryo of 48 hrs. of incubation.
 - 2) Give an account of oogenesis.
 - 3) Describe development of amphioxus upto 3 germinal layers.
-



- 6) The partial differential equation $(2x + 3y)p + 4xq - 8pq = x + y$ is _____
 a) linear b) non-linear c) quasilinear d) semilinear
- 7) The complete integral of $f(p, q) = 0$ is _____
 a) $z = ax - \phi(a)y + c$ b) $z = ax + \phi(a)y + cx^2$
 c) $z = ax + \phi(a)y + c$ d) $z = ax + \phi(a) + c$
- 8) The complete integral of $p^2 + q^2 = m^2$ is _____
 a) $z = ax + y(m^2 - a^2)^{\frac{1}{2}} + c$ b) $z = ax - y(m^2 - a^2)^{\frac{1}{2}} + c$
 c) $z = ax + y(m^2 + a^2)^{\frac{1}{2}} + c$ d) $z = ax + (m^2 - a^2)^{\frac{1}{2}} + c$
- 9) The particular integral of $\frac{1}{D - mD'} f(x, y) =$ _____
 a) $\int f(x, c + mx) dx$ b) $\int f(y, c - mx) dx$
 c) $\int f(x, c - mx) dx$ d) $\int f(y, c + my) dy$
- 10) Auxiliary equation of $r - 2s + t = \sin(2x + 3y)$ is _____
 a) $m^2 - 2m + 1 = \sin(2x + 3y)$
 b) $m^2 + 2m + 1 = \sin(2x + 3y)$
 c) $(m - 1)^2 = 0$
 d) $(m + 1)^2 = 0$
- 11) The general solution of $4r - 4s + t = 0$ is _____
 a) $z = \phi_1(2y + x) + x\phi_2(2y + x)$
 b) $z = \phi_1(y + 2x) + \phi_2(y + 2x)$
 c) $z = \phi_1(2y - x) + x\phi_2(2y + x)$
 d) None of these



- 12) The P.I. of $\frac{1}{D^2 + D'^2} 12xy$ is _____
- a) $(x + y)^4$ b) $(x + y)^3$ c) $(x - y)^3$ d) $(x + y)^2$
- 13) The general solution of $(D - D')z = 0$ is _____
- a) $\sum A e^{k^2x+ky}$ b) $\sum A e^{k^2x-ky}$ c) $\sum e^{k^2x+y}$ d) None of these
- 14) The particular integral of $(D^2 - D'^2 + D - D')z = e^{2x+3y}$ is _____
- a) $\frac{1}{6} e^{2x+3y}$ b) e^{2x+3y} c) $-\frac{1}{6} e^{2x+3y}$ d) $\frac{1}{16} e^{2x+3y}$

2. Attempt **any seven** of the following :

14

1) Form partial differential equation by eliminating arbitrary constant a, b from

the relation $2z = \frac{x^2}{a^2} + \frac{y^2}{b^2}$.

2) Prove that the complete integral of the equation

$(px + qy - z)^2 = 1 + p^2 + q^2$ is $ax + by + cz = (a^2 + b^2 + c^2)^{\frac{1}{2}}$.

3) Find a complete integral of $p^2 - 3x^2 = 9^2 - y$.

4) Show that $p = 1 + e^{x/y}$, $q = 1 + e^{x/y} (1 - \frac{x}{y})$ are compatible.

5) Solve $p \tan x + q \tan y = \tan z$.

6) Solve $(D^2 + 3DD' + 2D'^2)z = 0$

7) Solve $(D^2 - DD' + D' - 1)z = 0$

8) Solve $(D^2 - D'^2 + D - D')z = e^{x+3y}$

9) Solve $r + t + 2s = 0$.



3. A) Attempt **any two** of the following : 10

1) Form a partial differential equation by eliminating the arbitrary function ϕ from $\phi(x + y + z, x^2 + y^2 - z^2) = 0$.

2) Solve $(D^3 - 4D^2 D' + 4D D'^2) z = \cos(2x + y)$.

3) Find complete and singular integral from $z = px + qy + c \sqrt{1 + p^2 + q^2}$.

B) Explain the method of solving the equation of the form $f(p, q, z) = 0$. 4

4. Attempt **any two** of the following : 14

1) Find the integral surface of the linear partial differential equation

$$x(y^2 + z)p - y(x^2 + z)q = (x^2 - y^2)z$$

which contains the straight line $x + y = 0, z = 1$.

2) Solve $(D^2 + DD' + D' - 1)z = \sin(x + 2y)$.

3) For homogenous linear partial differential equation with constant coefficient.

Then prove that
$$\frac{1}{(bD - aD')^n} \phi(ax + by) = \frac{X^n}{b^n n!} \phi(ax + by).$$

5. Attempt **any two** of the following : 14

1) Explain Charpit's method of solving partial differential equation

$$f(x, y, z, p, q) = 0 \text{ where } p \text{ and } q \text{ are independent variables and } p = \frac{\partial z}{\partial x}, q = \frac{\partial z}{\partial y}$$

and hence solve $q = 3p^2$.

2) Explain the Lagrange's method of solving $P_p + Q_q = R$ when P, Q and R are functions of X, Y, Z and hence solve $p + 3q = z + \cot(y - 3x)$.

3) Solve $(D^2 - 3DD' + 2D'^2)z = e^{2x-y} + e^{x+y} + \cos(x + 2y)$.



- vi) The cells in the transportation problem can be classified as
- a) assigned and occupied cells
 - b) occupied and unoccupied cells
 - c) unoccupied and empty cells
 - d) none of these
- vii) In assignment problem if number of columns is greater than number of rows then
- a) dummy column is added
 - b) dummy row is added
 - c) any column is deleted
 - d) none of these
- viii) The slack for an activity in network is equal to
- a) LS-ES
 - b) LF-LS
 - c) EF-ES
 - d) EF-LS
- ix) The expected sample size required to arrive at a decision about the lot is called
- a) a random variable
 - b) average sample number
 - c) both a) and b)
 - d) none of these
- x) When there is no defective in the lot, the OC function for $p = 0$ is
- a) $L(p) = 0$
 - b) $L(p) = 1$
 - c) $L(p) = \infty$
 - d) none of these
- xi) The probability of accepting a lot with rejectable quality level p is known as
- a) Consumer's risk
 - b) Type I error
 - c) Producer's risk
 - d) None of these
- xii) In standard form of LPP
- a) The constraints are inequalities of \geq type
 - b) The constraints are inequalities of \leq type
 - c) The constraints are strict equations
 - d) The decision variables are unrestricted in sign
- xiii) The solution to a transportation problem with m -sources and n -destinations is non-degenerate, if the number of allocations are
- a) $m + n + 1$
 - b) $m + n$
 - c) $m + n - 1$
 - d) $m \times n$
- xiv) An assignment problem can be
- a) Designed and solved as a transportation problem
 - b) Of maximization type
 - c) Solved only if number of rows equals the number of columns
 - d) All of the above



2. Answer **any seven** of the following : 14

- i) Define a LPP.
- ii) Define a surplus variable.
- iii) What is an unbalanced assignment problem ?
- iv) When a transportation problem is said to be balanced ?
- v) Define a dummy activity.
- vi) Define a critical path.
- vii) What is a producer's risk ?
- viii) Define an A.Q.L.
- ix) Define a pessimistic time of an activity.

3. A) Answer **any two** of the following : 10

- i) Define assignment problem and write its mathematical form.
- ii) Differentiate between CPM and PERT.
- iii) Convert the following L.P.P. in its standard form.

$$\begin{aligned} \text{Min } Z &= x_1 + 1.5x_2 \\ \text{subject to} \\ x_1 + x_2 &\geq 1 \\ 100x_1 + 10x_2 &\geq 50 \\ 10x_1 + 100x_2 &\geq 10 \\ x_1 \geq 0, x_2 &\geq 0 \end{aligned}$$

B) In a Single Sampling Plan if $N = 15000$, $n = 50$, $c = 2$, $p = 0.01$ and $P_a = 0.986183$, then calculate the average total inspection per lot and average outgoing quality. 4

4. Answer **any two** of the following : 14

i) Find IBFS to the following transportation problem by using Vogel's Approximation Method.

		To				Available
		I	II	III	IV	
From	A	5	1	3	3	34
	B	3	3	5	4	15
	C	6	4	4	3	12
	D	4	-1	4	2	19
Demand		21	25	17	17	



- ii) Explain Simplex Method of finding an optimum solution of a LPP.
- iii) A project schedule has the following activities and the time (in hours) of completion of each activity is as follows :

Activity	1 – 2	2 – 4	1 – 3	3 – 4	4 – 5	5 – 6	3 – 6
Time	70	55	15	26	30	40	85

Draw the network diagram. Use only forward pass and find the minimum time of completion of the project.

5. Answer **any two** of the following :

14

- i) The following assignment problem shows the costs of assigning four jobs to four machines. Determine the optimum assignment schedule.

		Machines			
		1	2	3	4
Jobs	A	80	40	20	60
	B	0	90	50	50
	C	30	80	90	20
	D	40	30	10	0

- ii) Find an optimum solution to the LPP given below by using graphical method.

$$\text{Max } Z = 6x_1 + x_2$$

subject to

$$2x_1 + x_2 \geq 3$$

$$x_2 - x_1 \geq 0$$

$$x_1 \geq 0, x_2 \geq 0$$

- iii) Give the procedure of Double Sampling Plan.
-



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**B.Sc. – III (Semester – V) (New CGPA) Examination, 2017
GEOLOGY
Hydrogeology and Remote Sensing (Special Paper – X)**

Time : 2½ Hours

Max. Marks : 70

- Instructions :** 1) **All questions are compulsory.**
2) **Figures to the right indicate full marks.**
3) **Draw neat labelled diagrams wherever necessary.**

1. Fill in the blanks with correct answer from given options : **14**
- 1) Seasonal fluctuation is caused in ____ of a well.
a) surface runoff b) transpiration c) sediment d) water table
 - 2) Porosity of rock promotes ____
a) infiltration b) transpiration c) precipitation d) cone of depression
 - 3) Low porosity/permeability of rock promotes ____
a) precipitation b) transpiration c) surface runoff d) cone of depression
 - 4) ____ water is trapped in the sedimentary rocks at the time of its deposition.
a) Juvenile b) Connate c) Magmatic d) Volcanic
 - 5) _____ is an impermeable formation, which may contain water but is incapable of transmitting significant water quantities.
a) aquifer b) aquifuge c) aquiclude d) voids
 - 6) Arrange the sequence of vertical distribution of groundwater starting from surface of the earth : i) zone of intermittent saturation, ii) zone of saturation and iii) zone of aeration
a) iii), ii) and i) b) i), ii) and iii) c) ii), iii) and i) d) iii), i) and ii)
 - 7) _____ is the capacity of a rock to transmit fluids through it.
a) permeability b) porosity c) permittivity d) none of these



- 8) Satellites, Balloons, Airplane, Helicopters and pigeon are _____
a) sensors b) platforms c) objects d) cameras
- 9) When wavelength of electromagnetic waves increases, their frequency _____
a) decreases b) increases c) remain same d) none of these
- 10) The ultraviolet (UV) portion of the electromagnetic spectrum has range between wavelengths _____ μ m.
a) 0.300 and 0.446 b) 0.0300 and 0.0446
c) 3.00 and 4.46 d) 30.0 and 44.6
- 11) _____ in the atmosphere absorbs large amount of radiation energy of various wavelengths.
a) O_3 b) H_2O c) CO_2 d) all of these
- 12) _____ is a science branch dealing with surveying and mapping using the aerial photographs.
a) Photointerpretation b) Photogrammetry
c) Photorecognition d) Photosynthesis
- 13) In _____ aerial photographs, the optical axis is not perpendicular to the ground surface.
a) Oblique b) Vertical c) Horizontal d) Parallel
- 14) The _____ is the geometric centre of a photograph.
a) Principal point b) Fiducial mark c) Centre point d) Focal point

2. Answer **any seven** of the following :

14

- i) What is forward overlap ?
- ii) How to identify natural vegetation and artificial turf in aerial photographs ?
- iii) What is spectral range of microwave ?
- iv) What is passive remote sensing ?
- v) What is Nadir point ?
- vi) Define water table.
- vii) Define surface runoff.
- viii) Define transpiration.
- ix) What are sensors ?



3. A) Write short notes on **any two** of the following : 10
- i) What are primary and secondary porosity ?
 - ii) What are advantages of photogeology ?
 - iii) Explain various sources of groundwater.
- B) Describe in detail hydrological cycle. 4
4. Answer **any two** of the following : 14
- i) Describe types of air photographs based on optical axis position.
 - ii) Describe atmospheric windows.
 - iii) Describe perched aquifer.
5. Answer **any two** of the following : 14
- i) How rocks and soil types are identified on aerial photographs ?
 - ii) Describe in detail errors occur during flying.
 - iii) Describe the utilization of ground water.
-



- 6) Graves disease is an example of _____
A) Organ specific autoimmune disease
B) Non organ specific autoimmune disease
C) Type I hypersensitivity
D) Type II hypersensitivity
- 7) Antibodies involved in anaphylactic reactions are _____ class.
A) IgG
B) IgE
C) IgM
D) IgD
- 8) MHC class I molecules are present on surface of _____
A) All nucleated cells
B) Only antigen presenting cells
C) Only platelets
D) R.B.C.S.
- 9) Cytokines secreted by some leukocytes and act on other leukocytes are called _____
A) Monokines
B) Lymphokines
C) Interleukins
D) Chemokines
- 10) Graft between genetically identical individuals (i.e. twins) _____
A) Are rejected
B) Are not rejected if a kidney is grafted but skin grafts are rejected
C) Are not rejected
D) Are subject to hyper acute rejection
- 11) The failure to reject or inactivate self reactive cells results in _____
A) Autoimmunity
B) Positive selection
C) Negative selection
D) Suppression
- 12) Atopy is _____ hypersensitivity reaction.
A) Type I
B) Type III
C) Type IV
D) Type II
- 13) B cell receptor is _____
A) IgM
B) IgG
C) IgA
D) CD3
- 14) Macrophages secrete _____
A) Histamine
B) TNF_{α}
C) Serotonin
D) Antibodies



2. Solve **any seven** of the following (out of **9**) : **14**
- 1) Which are the activators of alternate complement activation pathway ?
 - 2) Give reasons for atopic sensitivity.
 - 3) What are the symptoms associated with incompatible blood transfusion ?
 - 4) Which cells produce interleukin – 1 ? Give its role.
 - 5) What is thrombocytopenic purpura ?
 - 6) What is xenograft ?
 - 7) Give two differentiate features between humoral and cell mediated immune response.
 - 8) Name secondary mediators of anaphylaxis.
 - 9) What are the properties of myeloma cells used for Hybridoma technique ?
3. A) Attempt **any 2** : **10**
- 1) Cytokines
 - 2) Burnets clonal selection theory
 - 3) Hemocytolytic autoimmune diseases.
- B) Rh blood group system. **4**
4. Attempt **any 2** : **14**
- 1) Immunological tolerance.
 - 2) Classical complement activation pathway.
 - 3) ABO blood group system.
5. Attempt **any 2** : **14**
- 1) Anaphylaxis.
 - 2) MHC.
 - 3) Hybridoma technique.
-



- vi) Which of the following statement is true for LCD ?
- a) External illumination is required
 - b) Self illuminated device
 - c) Alpha-numeric display is not possible
 - d) Quartz-crystals are used
- vii) The degree of exactness of measurement compared to the expected value is _____
- a) Error
 - b) Resolution
 - c) Precision
 - d) Accuracy
- viii) The principle of operation of an LVDT sensor is based on change in _____
- a) Self-inductance
 - b) Mutual-inductance
 - c) Reluctance
 - d) None of these
- ix) The power consumption of LED with respect to LCD is _____
- a) Less
 - b) More
 - c) Same
 - d) Can't say
- x) The instrument designed to measure minimum value zero to maximum value of input signal is known as _____
- a) Hysteresis
 - b) Sensitivity
 - c) Range of span
 - d) Input-variable
- xi) The electro-magnetic relay coil is also know as _____
- a) Pivot
 - b) Yoke-coil
 - c) Reluctant
 - d) Armature
- xii) The lock-in-amplifier is nothing but _____
- a) Phase-sensitive detector
 - b) Phase corrector
 - c) Phase-lag-network
 - d) Phase-lead-network
- xiii) The grounding and shielding technique are used to reduce _____
- a) Power consumption
 - b) Noise in the circuit
 - c) Cost and size
 - d) Signal level
- xiv) The instrumentation amplifier is having _____
- a) Low value of CMRR
 - b) High value of CMRR
 - c) Low value of gain
 - d) High impedances



2. Attempt **any seven** of the following : **14**
- i) Enlist the different types of errors.
 - ii) Give the principle of thermo-couple.
 - iii) Write the applications of piezo-electric sensor.
 - iv) What do you understand by compensating techniques ?
 - v) Give the objectives of DAS.
 - vi) Write the role of proper grounding of the circuit.
 - vii) Distinguish between LED and LCD.
 - viii) Draw the circuit diagram of instrumentation amplifier.
 - ix) Explain briefly gas sensors.
3. A) Attempt **any two** of the following : **10**
- i) Write a note on X-T recorder.
 - ii) Explain single channel DAS with block diagram.
 - iii) Explain construction and operation of strain gauge.
- B) Explain the working of weighing scale with the help of block diagram. **4**
4. Attempt **any two** of the following : **14**
- i) Explain the data logger system in details.
 - ii) Explain the operation of Hall-effect sensor. How it can used to measure hall-voltage ?
 - iii) Explain X-Y recorder.
5. Attempt **any two** of the following : **14**
- i) Explain the suitable signal conditioning system, to measure temperature of the range 1000°C.
 - ii) What are the actuators ? Explain the electro-magnetic relay as an on-off controller.
 - iii) What is signal conditioning ? Explain the basic elements of the signal conditioning system.
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B.Sc. – III (Semester – V) (New CGPA) Examination, 2017
COMPUTER SCIENCE
Special Paper – X : Data Communications and Networking – I

Time : 2.30 Hours

Max. Marks : 70

N.B : 1) ***All questions are compulsory.***
2) ***Figures to the right indicate full marks.***

1. Choose correct alternatives. **14**
- 1) _____ OSI layer incorporates the MAC address.
a) Data Link b) Network c) Physical d) Application
 - 2) Many low speed channels are interwoven into one high-speed transmission by
a) TDM b) FDM c) CDM d) None
 - 3) The transport layer does
a) Multiplexing b) Segmentation c) Splitting d) All
 - 4) _____ device introduces maximum delay into the network.
a) modem b) gateway c) switch d) all
 - 5) _____ transmission methods is suitable for five T.V. transmissions.
a) Synchronous b) Isochronous c) Asynchronous d) None
 - 6) Which layer is responsible for process to process delivery ?
a) Network layer b) Transport layer
c) Session layer d) Data link layer
 - 7) CRC stands for
a) cyclic redundancy check b) code repeat check
c) code redundancy check d) cyclic repeat check



- 8) Which one of the following routing algorithm can be used for network layer design ?
- a) shortest path algorithm b) distance vector routing
c) link state routing d) all of these
- 9) _____ topology requires multipoint connection.
- a) Star b) Mesh c) Ring d) Bus
- 10) What is internet ?
- a) a single network
b) a vast collection of different networks
c) interconnection of local area networks
d) none of these
- 11) Packet switching uses _____ transmission.
- a) queuing b) store and forward
c) master-slave d) polling and selection
- 12) Congestion is caused by
- a) Slow links b) Slow processors
c) Packets from many lines d) All
- 13) _____ involves grouping many separate wires into a common cable enclosure.
- a) SDM b) TDM c) FDM d) All
- 14) Cordless telephone uses _____ characteristic.
- a) Unidirectional b) Omni directional
c) Bidirectional d) Focused beam

2. Attempt **any seven** of the following :

14

- 1) What is fiber optics ?
- 2) State difference between analog and digital signal.
- 3) Which are the components of the network ?
- 4) What is shortest path routing ?
- 5) Explain framing.



- 6) Define standards.
 - 7) What is flooding ?
 - 8) What is synchronous and a synchronous transmission ?
 - 9) What is amplitude modulation ?
3. A) Answer **any two** of the following : **10**
- 1) What is modulation ? Explain its types.
 - 2) Which are the services of network layer ?
 - 3) Explain data representation.
- B) Explain various applications of internet. **4**
4. Answer **any two** of the following : **14**
- 1) What is multiplexing ? Explain frequency division multiplexing.
 - 2) What is stop and wait ARQ protocol ? Explain.
 - 3) Explain TCP/IP reference model.
5. Answer **any two** of the following : **14**
- 1) What is routing ? Explain multicast routing.
 - 2) Explain CSMA/CA in detail.
 - 3) Explain message switching in detail.
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B.Sc. – III (Semester – V) (Old) Examination, 2017
ENGLISH COMPULSORY
Breakthrough

Time : 2 Hours

Max. Marks : 50

N.B. : 1) *All questions are compulsory.*
2) *Figures to the right indicate full marks.*

1. A) Rewrite the following sentences by choosing the correct options given below. **6**
- 1) G.B. Shaw says, in revolutions, it is the respectful _____ who burn the country houses and parsonages.
a) rich b) lords c) warriors d) peasants
 - 2) The Gettysburg Address is the famous speech delivered by President Lincoln at Gettysburg in
a) 1861 b) 1863 c) 1860 d) 1862
 - 3) Shaw asserts that the poor are kept poor by their
a) poverty b) knowledge c) ignorance d) craft
 - 4) In A Room of One's Own Virginia Woolf imagines a _____ of Shakespeare.
a) cousin b) sister c) daughter d) disciple
 - 5) Abu Ben Adhem was blessed by the _____ of God.
a) hatred b) curse c) love d) angel
 - 6) "O Captain ! My Captain ! Our fearful _____ is done".
a) trip b) job c) task d) dream
- B) Rewrite the following bits by selecting the correct modals. **2**
- 1) If he works hard, he _____ succeed.
a) could b) might c) may d) had to
 - 2) The team took a decision that it _____ do more net-practice.
a) will b) might c) shall d) would
- C) Do as directed. **2**
- 1) Radhika said, "I am going to work hard from today".
(Change into Indirect Speech)
 - 2) Karim asserted that he would see his teacher the next day.
(Change into Direct Speech).



2. Answer **any five** of the following questions in **2 to 3** sentences **each**. **10**
- How has Shaw brought out the corruption in Church ?
 - What did Lincoln say about the sacrifice of the brave men ?
 - How does the society destroy the talents of women writers ?
 - Give the definition of democracy according to Lincoln.
 - What was the opinion of the old Bishop about women ?
 - How would the peasants behave during a revolution ?
3. A) Answer **any two** of the following questions in about **fifty** words **each**. **6**
- 1) What did Abu Ben Adhem see in his vision ?
 - 2) Why is the poet making an appeal to the Captain to rise ?
 - 3) How did Abu's name lead all the rest in the book of gold ?
- B) Write reports in brief on **any two** of the following : **4**
- Making veg pulaav.
 - Visit to a zoo in your city.
 - A road accident you saw.
4. Prepare a presentation script on **any one** of the following using charts or slides. **10**
- Merits of democracy.
 - Promotion of a newly launched 'hatch-back car'.
5. Ramesh, Sara, Manila and James participate in a group discussion on 'Twenty-twenty Cricket Matches', write a script of the discussion by using points in favour of and against the subject. **10**
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B.Sc. – III (Semester – V) Examination, 2017
CHEMISTRY
Physical Chemistry (Special Paper – IX) (Old)

Time : 2.00 Hours

Max. Marks : 50

- N. B. :** i) **All questions are compulsory.**
ii) **Figures to the right indicate full marks.**
iii) **Neat diagrams must be drawn whenever necessary.**
iv) **Use of logarithmic table/scientific calculator is allowed.**

1. Choose the correct alternative for the following and rewrite the sentence : 10

- i) In photosynthesis _____ acts as sensitizer.
a) Water b) Moisture c) Heat d) Chlorophyll
- ii) The quantity $(2S + 1)$ is known as _____ of state.
a) Spin pairing b) Spin multiplicity
c) Singlet d) Excited
- iii) The energy associated with a photon is given by equation _____
a) $E = h\nu$ b) $E = hc$ c) $E = \frac{hc}{\lambda}$ d) $E = hc^2$
- iv) When single phase is present in two component system the degree of freedom is _____
a) three b) two c) one d) zero
- v) The vapour-pressure of the metastable phase is always _____ than that of stable phase.
a) Constant b) Higher c) Lower d) Decreases
- vi) What is the emf of a cell, $A | A^+ || B^+ | B$?
Given $E^\circ_{A^+/A} = 0.34V$ and $E^\circ_{B^+/B} = -0.77V$.
a) 1.11V b) -1.11V c) -0.43V d) 0.43V
- vii) In concentration cells, emf is produced due to decrease in _____ accompanying the cell reaction.
a) Volume b) Temperature c) Free energy d) Entropy

P.T.O.



viii) The entropy change of the cell reaction is given by, $\Delta S =$ _____

a) $-nF \left(\frac{dE}{dT} \right)$

b) $nE_c F \left(\frac{dE}{dT} \right)$

c) $-nE_c F \left(\frac{dE}{dT} \right)$

d) $nF \left(\frac{dE}{dT} \right)$

ix) Which of the following electrode can be used to measure pH ?

- a) Silver b) Glass c) Platinum d) Cadmium

x) The relation between standard free energy change and equilibrium constant is given by equation _____

a) $\Delta G^\circ = RT \ln k$

b) $\Delta G = -RT \ln k$

c) $\Delta G^\circ = -RT \ln k$

d) $\Delta G = RT \ln k$

2. Answer **any five** of the following :

10

- i) Give reduced phase and indicates the terms involved in it.
- ii) Define : a) Polymorphism b) Allotropy
- iii) Write the half cell reactions for zinc and copper electrodes.
- iv) Write electrode reaction and potential equation for silver-silver chloride electrode.
- v) Mention different laws of photochemistry and state Beer's law.
- vi) State Nernst equation for emf of cell and indicates the terms involved in it.

3. A) Answer **any two** of the following :

6

- i) Describe photo sensitized reaction with suitable example.
 - ii) Describe the application of emf measurement in determination of pH of solution.
 - iii) Draw neat diagram of water system and explain the degree of freedom is zero.
- B) Calculate emf of the concentration cell made up of cadmium in mercury amalgams and using CdCl_2 as electrolyte solution at 298K. One amalgam contains 12 mg of cadmium per gram of mercury and other containing 0.25 mg of cadmium per gram of mercury.

Given : $R = 8.314 \text{ JK}^{-1} \text{ mole}^{-1}$, $F = 96500 \text{ Coulombs}$.

4

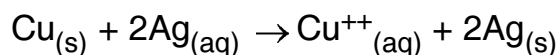


4. Answer **any two** of the following : 10

- i) Discuss the applications of phase rule to Pb – Ag system.
- ii) Calculate the energy in joules per quantum and joules per mole of photon of wavelength 650 nm.
Given : $h = 6.626 \times 10^{-34} \text{ Js}$, $c = 3.0 \times 10^8 \text{ ms}^{-1}$, $N = 6.023 \times 10^{23} \text{ mole}^{-1}$
- iii) Derive an expression for the emf of a concentration cell without transference; which is reversible to cation.

5. Answer **any two** of the following 10

- i) Explain photodimerization of anthracene.
- ii) Calculate equilibrium constant for the following reaction at 298 k.



$$E^\circ_{\text{cell}} = 0.537\text{V}; R = 8.314\text{JK}^{-1}, F = 96500 \text{ Coulombs.}$$

iii) The emf of the cell,

$\text{Ag}_{(s)} | \text{AgCl}_{(s)} | \text{KCl solution} | \text{Hg}_2\text{Cl}_{2(s)} | \text{Hg}_{(l)} | \text{Pt}$; is 0.0345V at 298K. The temperature coefficient the cell is $2.98 \times 10^{-4} \text{ V K}^{-1}$ calculate the values of ΔG and ΔH . Given : $F = 96500 \text{ Coulombs}$.



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B.Sc. – III (Semester – V) (Old) Examination, 2017
ZOOLOGY (Special Paper – IX)
Non-Chordates

Time : 2 Hours

Max. Marks : 50

- Instructions:** 1) *All questions are compulsory.*
2) *Draw neat labelled diagrams wherever necessary.*
3) *Figures to the right indicates full marks.*

1. Select the appropriate answer from **each** of the following and rewrite the sentence. **10**
- 1) _____ type of canal system is found in Sycon.
a) Leucon b) Sycon c) Ascon d) Rhagon
 - 2) _____ is an asexual reproduction in paramoecium.
a) Conjugation b) Automixis c) Binary fission d) Syngamy
 - 3) Polymorphism occurs in
a) Termites b) Certain ants c) Snails d) Coelenterates
 - 4) Autotrophic type of nutrition is found in
a) Amoeba b) Euglena c) Entamoeba d) Paramoecium
 - 5) In Hirudinaria, the space between body wall and alimentary canal is filled with
a) Haemal fluid b) Air space
c) Botryoidal tissue d) Haemocoel
 - 6) _____ is the larva of sea star.
a) Bipinnaria b) Doliolaria c) Ophiopluteus d) Echinopluteus
 - 7) _____ number of crop chambers are present in leech.
a) 7 b) 11 c) 10 d) 8
 - 8) The larva of butterfly, moth is _____ larva.
a) Polypod b) Oligopod c) Apodus d) Nymph



- 9) _____ is a good example of living fossil.
a) Limulus b) Lingula c) Peripatus d) Sagitta
- 10) Sea star has great power of
a) Morphogenesis b) Histolysis c) Haemolysis d) Regeneration

2. Answer **any five** of the following : **10**
- i) Cyclosis in paramecium.
 - ii) Course of water current in Sycon.
 - iii) Apodus larva.
 - iv) Jaws of leech.
 - v) Systematic position of Sea star.
 - vi) Holometabolous metamorphosis.
3. A) Answer **any two** of the following : **6**
- i) Salient features of lingula.
 - ii) Zoological importance of peripatus.
 - iii) Tube-foot of sea star.
- B) Describe Locomotion in leech. **4**
4. Answer **any two** of the following : **10**
- i) Describe conjugation of paramecium.
 - ii) Describe testicular nephridium of leech.
 - iii) Describe polymorphism in Coelenterata.
5. Answer **any one** of the following : **10**
- i) Describe digestive system of leech.
 - ii) Describe water-vascular system in sea-star.
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Seat No.	
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B.Sc. – III (Semester – V) (Old) Examination, 2017
MATHEMATICS (Special Paper – IX)
Algebra – II

Time : 2 Hours

Max. Marks : 50

Instructions: 1) *All questions are compulsory.*
2) *Figures to the right indicate full marks.*

1. Choose the correct alternative of the following : 10
- 1) Which structure is not a field ?
a) $(\mathbb{R}, +, \cdot)$ b) $(\mathbb{C}, +, \cdot)$ c) $(\mathbb{E}, +, \cdot)$ d) $(\mathbb{Q}, +, \cdot)$
 - 2) The characteristic of the ring $3\mathbb{Z}$ is
a) 0 b) 2 c) 3 d) 4
 - 3) The number of ideals in a field F is
a) 0 b) 2 c) 1 d) infinite
 - 4) Over the field of real numbers the vector space of complex numbers has dimension
a) 1 b) 2 c) 0 d) i
 - 5) Let $T : V \rightarrow W$ is linear. Then the null space $N(T)$ of T is
a) $\{x \in V/T(x) = 0\}$ b) $\{T(x)/x \in V\}$
c) $\{x \in W/T(x) = 0\}$ d) $\{x \in V/T(x) = e\}$
 - 6) The span $\{(0, 1, 0), (0, 0, 1)\}$ contains all the points in
a) xy plane b) yz plane c) xz plane d) z plane
 - 7) If $x = (a, b, c) \in \mathbb{R}^3$, then $\sqrt{\langle x, x \rangle} =$
a) $\sqrt{a+b+c}$ b) $a^2+b^2+c^2$ c) $\sqrt{a^2+b^2+c^2}$ d) $(a^2+b^2+c^2)^2$
 - 8) If $x = (1 + i, 4)$ and $y = (2 - 3i, 4 + 5i)$ in \mathbb{C}^2 , then $\langle x, y \rangle$
a) $15 - 15i$ b) $15 + 15i$
c) $-15 + 15i$ d) $-15 - 15i$



9) $T : P_n(\mathbb{R}) \rightarrow P_{n-1}(\mathbb{R})$ defined by $T(f(x)) = f'(x)$, where $f'(x)$ denotes the derivative of $f(x)$. Then T is

- a) Linear transformation b) Not a linear transformation
c) Other data are required d) None of these

10) If $T : \mathbb{R}^3 \rightarrow \mathbb{R}^2$ be the linear transformation defined by $T(a_1, a_2, a_3) = (a_1 - a_2, 2a_3)$. Then $N(T) =$

- a) $\{(a, a, 0) : a \in \mathbb{R}\}$ b) $\{(a, 0, 0) : a \in \mathbb{R}\}$
c) $\{(0, 0, 0)\}$ d) $\{(0, a, 0) : a \in \mathbb{R}\}$

2. Attempt **any five** :

10

1) If Z_{12} is a ring under addition and multiplication modulo 12, then find its all maximal ideal.

2) Verify the distributive law

$$[(I + a) + (I + b)] (I + C) = (I + a) (I + c) + (I + b) (I + c)$$

3) Let $T : \mathbb{R}^2 \rightarrow \mathbb{R}^3$ be a linear defined by $T(x_1, x_2) = (x_1 - x_2, x_2 - x_1, -x_1)$. Show that T is one-one.

4) Let V be an inner product space. Then for $x, y, z \in V$ and $C \in F$. Then prove that $\langle x, y + z \rangle = \langle x, y \rangle + \langle x, z \rangle$.

5) If T be a linear transformation on \mathbb{R}^2 defined by $T(x_1, x_2) = (2x_1 + 3x_2, x_1 - x_2)$. Then find $R(T)$.

6) If x and y are vectors in a real inner product space and if $\|x\| = \|y\|$ then $x + y$ and $x - y$ are orthogonal.

3. A) Attempt **any two** :

6

1) Show that $S = \left\{ \begin{bmatrix} a & b \\ 0 & 0 \end{bmatrix} : a, b \in \mathbb{Z} \right\}$ is a subring of $M(2, \mathbb{Z})$.

2) Verify the relation

$$\langle u, aV_1 + bV_2 \rangle = \bar{a} \langle u, v \rangle + \bar{b} \langle u, v_2 \rangle.$$

3) Let V and W be vector spaces and $T : V \rightarrow W$ be linear. Then prove that $R(T)$ is subspace of W .

4) Show that a linear map $T : \mathbb{R}^3 \rightarrow \mathbb{R}^3$ defined by

$$T(x_1, x_2, x_3) = (x_1 + x_2, x_2 + x_3, x_1 + x_2 + x_3) \text{ is non-singular.}$$

B) Determine whether or not the set $\beta = \{(1, 1, 2), (1, 2, 5), (5, 3, 4)\}$ forms a basis for \mathbb{R}^3 .

4



4. Attempt **any two** : 10

1) Prove that the set of integers

$R = \{0, 1, 2, 3, 4\}$ forms a field under addition and multiplication modulus.

2) Let V and W be vector spaces over a field F and let $T, U : V \rightarrow W$ be linear. Then prove that for all $a \in F$, $aT + U$ is linear.

3) If x and y are vectors in an inner product space then show that

$$\|x + y\|^2 + \|x - y\|^2 = 2\|x\|^2 + 2\|y\|^2.$$

5. Attempt **any one** : 10

1) State and prove dimension theorem.

2) Let V be the vector space of polynomials with inner product given by

$$\langle f, g \rangle = \int_0^1 f(t) g(t) dt.$$

Let $f(t) = t + 2$ and $g(t) = t^2 - 2t - 3$. Find

a) $\langle f, g \rangle$ b) $\|f\|$ c) $\|g\|$



Seat No.	
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B.Sc. – III (Semester – V) (Old) Examination, 2017
STATISTICS
Statistical Inference – I (Special Paper – IX)

Time : 2 Hours

Max. Marks : 50

N.B. : 1) **All** questions carry **equal** marks.
2) **All** questions are **compulsory**.

1. Choose the correct alternative : **10**
- 1) If x_1, x_2 is a random sample from $U(0, \theta)$ then MLE of θ is
a) $x_1 + x_2$ b) $x_1 x_2$ c) $\text{Max}(x_1, x_2)$ d) $\text{Min}(x_1, x_2)$
 - 2) Which of the following is an estimation procedure ?
a) Point estimation b) Interval estimation
c) Both (a) and (b) d) None of these
 - 3) Which kind of values of a sample size n is concerned to consistency property ?
a) small values b) infinitely small values
c) large values d) any value
 - 4) Fisher's information based on a random sample of size 1 from a geometric (p) distribution is
a) $\frac{1}{p(1-p)}$ b) $\frac{1}{p(1-p)^2}$ c) $\frac{1}{p^2(1-p)}$ d) $\frac{1}{p^2(1-p)^2}$
 - 5) If x is a single observation from $N(0, \sigma^2)$ then the sufficient statistic for σ^2 is
a) $|x|$ b) x c) x^2 d) none of these
 - 6) Parameter is
a) Sample characteristic b) Population characteristic
c) Both a and b d) None of these
 - 7) Efficiency is a property associated to
a) Sample size b) Variance of the estimator
c) Both a and b d) None of these

P.T.O.



- 8) Cramer-Rao inequality is based on
- | | |
|------------------------|----------------------|
| a) Stringent condition | b) Mild conditioning |
| c) No condition | d) None of the above |
- 9) Generally the estimators obtained by the method of moments as compared to maximum likelihood estimators are
- | | |
|----------------------|----------------------|
| a) less efficient | b) more efficient |
| c) equally efficient | d) none of the above |
- 10) The denominator in the Cramer-Rao inequality is known as
- | | |
|---------------------------|----------------------------|
| a) information limit | b) lower bound of variance |
| c) upperbound of variance | d) all of the above |

2. Answer **any five** of the following :

10

- i) Find unbiased estimate of p for binomial distribution.

X : 0 1 2 3 4

Frq : 3 4 10 8 6

- ii) Define uniformly minimum variance unbiased (UMVUE) for a parameter.
- iii) Define relative efficiency of T_1 with respect to T_2 .
- iv) Define Pitman-Koopman form of sufficient statistic.
- v) Show that sample mean is an unbiased estimator of population mean.
- vi) Define Fisher information function in a statistic T about the parameter θ .
- vii) State invariance property of maximum likelihood estimator.

3. A) Attempt **any two** :

6

- i) Prove that if T_1 and T_2 are two distinct unbiased estimators of parameter θ then there exists infinitely many unbiased estimators of θ .
- ii) Explain the concept of sufficient statistic. State Neyman factorization criterion.
- iii) Let $x_1, x_2, x_3, \dots, x_n$ be a random sample from a distribution with pdf

$$f(x) = \frac{1}{\theta} \quad 0 < x < \theta.$$

Obtain the estimator of θ by the method of moments.

B) Obtain the maximum likelihood estimator of p in the following distribution.

$$f(x, p) = q p^{(x-1)} \quad x = 1, 2, \dots$$

4



4. Attempt **any two** of the following : 10

i) Let x_1, x_2, x_3 be random sample from Poisson distribution with parameter λ .

If $T_1 = \frac{(X_1 + 2X_2 + X_3)}{6}$ and $T_2 = \frac{(X_1 + X_2 + X_3)}{3}$ Show that T_1 and T_2 are unbiased estimators of λ .

ii) Let $x_1, x_2, x_3, \dots, x_n$ be random sample from

$$f(x, \theta) = \theta x^\theta \quad 0 < x < 1$$

Obtain sufficient statistic for θ .

iii) If $I(\theta)$ is information function of unknown parameter of θ of a distribution.

$$\text{Show that } I(\theta) = -E\left(\frac{d^2 \log f}{d\theta^2}\right).$$

5. Answer **any two** of the following : 10

i) State and prove Cramer-Rao inequality for the variance of an unbiased estimator for a parameter θ .

ii) Prove that uniformly minimum variance unbiased (UMVUE) is unique for a parameter θ .

iii) Let $x_1, x_2, x_3, \dots, x_n$ be random sample from Poisson distribution with parameter θ .

Obtain

a) Likelihood function L

b) Fisher information function $I(\theta)$.



Seat No.	
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B.Sc. – III (Semester – V) (Old) Examination, 2017
PHYSICS
Solid State Physics (Special Paper – X)

Time : 2 Hours

Max. Marks : 50

- Instructions:** 1) **All questions are compulsory.**
2) **Figures to right indicate full marks.**
3) **Neat diagram must be drawn wherever necessary.**
4) **Use of calculator and log table is allowed.**

1. Select the correct alternatives :

10

- 1) $a \neq b \neq c$ and $\alpha = \beta = \gamma = 90^\circ$ are the characteristics of _____ crystal system.
a) Orthorhombic b) Cubic c) Monoclinic d) Trigonal
- 2) Packing fraction of simple cubic crystal structure is
a) 0.34 b) 0.52 c) 0.74 d) 0.99
- 3) Volume of unit cell in reciprocal lattice is _____ proportional to the volume of unit cell in direct lattice.
a) Directly b) Inversely c) Not d) Equally
- 4) The ratio of thermal conductivity to electrical conductivity is proportional to
a) T b) $1/T$ c) T^2 d) T^3
- 5) Metals are good conductor of
a) Heat b) Electricity
c) Both heat and electricity d) Magnetism
- 6) Insulators have band gap energy of
a) 0 eV b) 1 eV c) 7 eV d) 0.7 eV
- 7) At the point of inflection, the value of effective mass of electron is
a) Zero b) Positive c) Infinity d) Negative



Seat No.	
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B.Sc. (Part – III) (Semester – V) (Old) Examination, 2017
CHEMISTRY
Inorganic Chemistry (Special Paper – X)

Time : 2 Hours

Max. Marks : 50

- N.B. :** 1) **All questions are compulsory.**
2) **Draw neat labelled diagram wherever necessary.**
3) **Figures to the right indicate full marks.**

1. Select the most correct alternative from the following and rewrite the sentences. **10**

- 1) According to MOT bonding between metal and ligand may be
 - a) Ionic
 - b) Covalent
 - c) Metallic
 - d) Ionic as well as covalent
- 2) $7\text{N}^{15} + 1\text{H}^1 \rightarrow 6\text{C}^{12} +$
 - a) 1H^1
 - b) 2He^4
 - c) γ -rays
 - d) 1H^2
- 3) Haemoglobin contain iron in _____ oxidation state.
 - a) +2
 - b) +3
 - c) +5
 - d) zero
- 4) In polymers formation of chain of _____ atoms is called catenation.
 - a) same
 - b) different
 - c) small
 - d) large
- 5) The solid materials having particle size _____ is called nanoparticles.
 - a) 1 to 100 nm
 - b) 1 to 100 m
 - c) 1 to 100 cm
 - d) 1000 nm
- 6) In low spin octahedral complex Δ_0 is _____ than pairing energy.
 - a) very low
 - b) more
 - c) less
 - d) intermediate
- 7) The isotope emitting the radiations is called _____ isotope.
 - a) radio
 - b) recoil
 - c) daughter
 - d) none of these
- 8) During crystal field splitting in octahedral complex eg orbital goes to higher energy level by _____ Δ_0 .
 - a) +6
 - b) +4
 - c) -6
 - d) -4



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**B.Sc. (Part – III) (Semester – V) Examination, 2017
ZOOLOGY (Special Paper – X) (Old)
Biostatistics, Bioinformatics, Medical Zoology and
Evolutionary Genetics**

Time : 2 Hours

Total Marks : 50

- N.B. :** 1) **All questions are compulsory.**
2) Draw **neat** labeled diagrams **wherever** necessary.
3) Figures to **right** indicate **full** marks.

1. Complete the sentence selecting appropriate answer : **10**

- 1) _____ is defined as sum of all the values derived by the total number of value.
a) Mean b) Variable
c) Median d) Mode
- 2) The disease malaria is caused by
a) Plasmodium b) Endamoeba
c) Vorticella d) Euglena
- 3) Ctrl + A is a command used for _____ the file in Bioinformatics.
a) To select all b) To delete all
c) To copy all d) To create all
- 4) The term used in population genetics to refer the statistical drift overtime gene frequency is called as
a) Genetic drift b) Gene net
c) Gene pool d) Gene bank
- 5) The pathogenic agent _____ is responsible for the disease Tuberculosis (TB).
a) Polio virus b) Bacterium
c) Plasmodium d) Fungi



- 6) In statistical table the lower limit of first class should be
- a) Ten
 - b) Five
 - c) Zero
 - d) Either zero or multiple of five
- 7) CPU is _____ device of bioinformatics.
- a) Storage
 - b) Print
 - c) Input
 - d) Output
- 8) Ctrl+X command used to _____ in computer used to.
- a) Paste
 - b) Delete
 - c) Select
 - d) Save
- 9) The use of statistics in biological science is known as
- a) Bioinformatics
 - b) Biostatistics
 - c) Biometry
 - d) Biotechnology
- 10) Profuse salivation in dog bite man is due to
- a) Poliovirus
 - b) H₁V₁ virus
 - c) Rabies
 - d) Antivirus

2. Write short notes on following (**any five**)

10

- i) Classification
- ii) Entrez search engine
- iii) Rabies virus
- iv) Key Board
- v) Importance of bioinformatics
- vi) Student's 'T' test.

3. A) Answer **any two** of the following :

6

- i) Give an account of symptoms of disease malaria.
- ii) Describe genetic drift.
- iii) Describe the different parts of statistical table.



B) Form a discrete frequency distribution from following data, in which marks obtained by 23 students in the examination.

10, 35, 20, 30, 20, 40, 25, 30, 10, 15, 40, 20, 25, 25, 35, 30, 35, 13, 15, 20, 25, 25, 20.

4

4. Answer **any two** of the following :

10

- i) Describe Hardy-Weinberg's law.
- ii) Give an account of pathogen and treatment of disease rabies.
- iii) Give an account of pathogen and symptoms of disease elephantiasis.

5. Answer **any one** of the following :

10

- i) Define the types of measurements of central tendency. Describe the mean and median.
 - ii) Describe the various search engines used in Bioinformatics. Also add a note on their applications.
-



7) If C is the circle $|z| = 1$ then $\int_C \bar{z} dz$ is

- a) πi b) $2\pi i$ c) 0 d) None of these

8) The residue of $\frac{z^3}{(z-1)(z-2)(z-3)}$ at $z = 1, 2, 3$ are respectively.

- a) $\frac{1}{2}, -8, \frac{27}{2}$ b) $1, -8, \frac{27}{2}$
 c) $\frac{1}{2}, 0, \frac{27}{2}$ d) None of these

9) The residue of $\frac{z^3}{z^2-1}$ at $z = \infty$ is _____

- a) -1 b) 1 c) 0 d) 2

10) The residue of $\frac{\sin \pi z^2 + \cos \pi z^2}{(z-1)^2(z-2)}$ at $z = 2$ is

- a) -1 b) 0 c) 2 d) 1

2. Attempt **any five** of the following :

10

1) Prove that the function $|z|^2$ is continuous everywhere but nowhere differentiable except at origin.

2) Find whether the function $f(z) = \bar{z}$ is analytic.

3) Evaluate $\int_L dz$.

4) Evaluate $\int_{(0,1)}^{(2,5)} (3x+y)dx + (2y-x)dy$, along the curve $y = x^2 + 1$.

5) Define residue at a pole.

6) Find the residue of $\frac{1}{(z^2+1)^3}$ at $z = i$.



3. A) Attempt **any two** of the following : 6

1) If the real part of an analytic function $f(z)$ is a given harmonic function

$$y(x, y), \text{ then to prove that } f(z) = 2u\left(\frac{z}{2}, \frac{z}{2i}\right) - u(0, 0).$$

2) Expand $f(z) = \frac{1}{(z + 1)(z + 3)}$ in a Laurent's series valid for the region $|z| < 1$.

3) If C is an arc $\theta_1 \leq \theta \leq \theta_2$ of the circle $|z| = R$ and if $\lim_{R \rightarrow \infty} z f(z)$, then

$$\lim_{R \rightarrow \infty} \int_C f(z) dz = i(\theta_2 - \theta_1)A.$$

B) Compute the residue of $f(z)$ at infinity. 4

4. Attempt **any two** of the following : 10

1) Find the analytic function of which the real part is $u = \frac{\sin 2x}{\cosh 2y - \cos 2x}$.

2) State and prove Cauchy's Fundamental Theorem.

3) Find the residues of $\frac{z^2 - 2z}{(z + 1)^2 (z^2 + 4)}$, at all its poles in the finite plane.

5. Attempt **any two** of the following : 10

1) Prove the Cauchy Riemann equations in polar form.

2) Find the value of the integral $\int_0^{1+i} (x - y + ix^2) dz$.

i) Along the straight line from $z = 0$ to $z = 1 + i$.

ii) Along the real axis from $z = 0$ to $z = 1$ and then along a line parallel to the imaginary axis from $z = 1$ to $z = 1 + i$.

3) Prove that $\int_0^\pi \frac{1 + 2 \cos \theta}{5 + 4 \cos \theta} d\theta = 0$.



Seat No.	
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B.Sc. – III (Semester – V) (Old) Examination, 2017
PHYSICS (Special Paper – XI)
Classical Mechanics

Time : 2 Hours

Max. Marks : 50

- Instructions :**
- i) **All questions are compulsory.**
 - ii) Figures to the **right** indicate **full** marks.
 - iii) **Neat diagrams must be drawn wherever necessary.**
 - iv) Use of log table or calculator is **allowed**.

1. Select correct alternative :

10

- i) Mechanics of a particle is contained in the Newton's _____ law of motion.
a) First b) Second c) Third d) Zero
- ii) The physical quantity, moment of inertia is a tensor of rank
a) 0 b) 1 c) 2 d) 3
- iii) In a cyclone in the northern hemisphere the wind whirls in the _____ sense.
a) Anticlockwise b) Clockwise
c) Opposite d) Same
- iv) In the symmetric mode of oscillation, the particles are oscillating always
a) In opposite phase b) With constant 45° phase
c) With constant 90° phase d) In phase
- v) When constraints are introduced into a system, its number of degrees of freedom
a) is reduced b) is increased
c) remains the same d) become zero
- vi) If all forces of a system are generated from a single function, the system is called _____ system.
a) Conservative b) Monogenic
c) Non-conservative d) Multigenic

P.T.O.



- vii) The maximum horizontal distance covered by a projectile is called the _____ of the projectile.
- a) Flight b) Trajectory c) Range d) None of these
- viii) If a particle is at rest in a rotating frame of reference the Coriolis force acting on it is
- a) Minimum b) Maximum c) Extremum d) Zero
- ix) Which of the following is the action integral ?

a) $\int_{t_1}^{t_2} L dt$

b) $\int_{t_1}^{t_2} V dt$

c) $\frac{\partial f}{\partial y_i} - \frac{\partial f}{\partial \dot{y}_i} = 0$

d) $\frac{\partial f}{\partial y_i} + \frac{d}{dt} \left(\frac{\partial f}{\partial \dot{y}_i} \right) = 0$

- x) A rigid body have _____ degrees of freedom.
- a) 9 b) 6 c) 3 d) 2

2. Attempt **any five** :

10

- i) Define scleronomous and rheonomous constraints.
- ii) What are coupled systems.
- iii) State the principle of conservation of angular momentum for a system of particles.
- iv) What are advantages of Hamilton's formulation ?
- v) What is a rigid body ?
- vi) Explain in brief the concept of centre of mass.

3. A) Attempt **any two** :

6

- i) State and prove the Euler's theorem about the motion of a rigid body.
- ii) Set up the Lagrangian for a simple pendulum and hence obtain the equation describing its motion.
- iii) What are symmetric and anti symmetric normal modes of oscillations ? Explain why the frequency in anti symmetric mode is greater than that in symmetric mode.

- B) Derive an expression for the total energy of a system of two coupled pendulums in terms of normal coordinates.

4



4. Attempt **any two** : **10**

- i) State and prove the conservation theorem for energy of system of particles.
- ii) Derive an expression for the kinetic energy of a rigid body in the components form.
- iii) Show that the shortest distance between two points in a plane is along a straight line.

5. Attempt **any one** : **10**

- i) What are the inertial and non-inertial frames of reference ? Show that the angular acceleration of a particle is the same in fixed and rotating coordinate systems.
 - ii) What do you mean by virtual displacement ? State the principle of virtual work. State D'Alembert's principle. Convert it into the generalized coordinates.
-



Seat No.	
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B.Sc. – III (Semester – V) (Old) Examination, 2017
CHEMISTRY
Organic Chemistry (Special Paper – XI)

Time : 2 Hours

Max. Marks : 50

- N. B. :** 1) **All questions are compulsory.**
2) **Draw neat diagram and give equation wherever possible.**
3) **Figures to the right indicate full marks.**
4) **Use of log table or calculator is allowed.**
5) **Spectroscopic chart is supplied.**

1. Choose correct alternative from each of the following : 10
- i) Smaller δ values implies _____
a) resonance b) downfield c) upfield d) flipping
- ii) Bayer calculated distortion in bond angle and strain in cycloalkanes by _____ formula.
a) $d = \frac{1}{2} (109.5 - \text{bond angle})$ b) $d = \frac{1}{2} (208 - \text{bond angle})$
c) $d = \frac{1}{2} (310 - \text{bond angle})$ d) $d = \frac{1}{2} (180 - \text{bond angle})$
- iii) _____ exhibits keto-enol tautomerism.
a) acetic acid b) acetophenone
c) acetamide d) acetoacetic acid
- iv) Strainless rings are _____
a) planar b) linear c) biplanar d) puckered
- v) The state of equivalence between precessional frequency of proton and irradiated radio frequency is called _____
a) flipping b) resonance c) chemical shift d) coupling constant
- vi) Bayer's strain theory fails to explain the stability of cycloalkanes beyond _____
a) cyclopropane b) cyclobutane c) cyclopentane d) none of these
- vii) Stobbe reaction is shown by aldehydes or ketones with _____
a) primary amine b) organozinc compound
c) diester of succinic acid d) ester of benzoic acid
- viii) Diethyl malonate reacts with urea to give _____
a) barbituric acid b) butyric acid c) butanoic acid d) glutaric acid

P.T.O.



- ix) The deflection of ions in mass spectroscopy depends on _____
 a) shape b) size c) charge d) mass to charge ratio
- x) Wittig reagent is _____
 a) $\text{Al}(\text{O.C.Me}_3)_3$ b) $\text{Br}_2 + \text{NaOH}$ c) $\text{Ph}_3\text{P} = \text{CRR}'$ d) NaOC_2H_5

2. Answer **any five** of the following : 10

- i) Define magnetic and non-magnetic nuclei.
- ii) Define syn elimination and anti elimination.
- iii) What is meant by reactive methylene group ? Give examples of compounds containing this group.
- iv) State and explain Hook's law.
- v) Complete the following reaction and name the reaction :

$$\text{CH}_3\text{CONH}_2 + \text{Br}_2 + 4\text{NaOH} \xrightarrow{\Delta} ?$$
- vi) Illustrate the principle of mass spectroscopy.

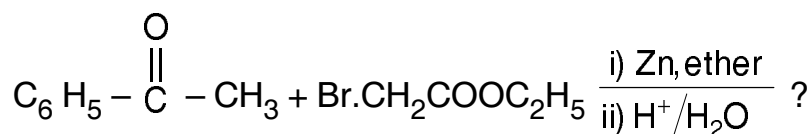
3. A) Answer **any two** of the following : 6

- i) How will you prepare succinic acid from malonic ester ?
- ii) Explain applications of mass spectroscopy.
- iii) Illustrate Oppenauer oxidation.

B) Explain synthesis of ethyl acetoacetate with mechanism. 4

4. Answer **any two** of the following : 10

- i) Write a note on Types of vibrations with suitable figures.
- ii) Discuss the relative stabilities of conformations of cyclohexane with energy potential curve.
- iii) Complete the following reaction with mechanism and name the reaction.



5. Solve **any two** of the following : 10

- i) Write a note on applications of IR spectroscopy.
- ii) Discuss the mechanism of Wagner-Meerwein rearrangement.
- iii) Assign the structure to the compound having following spectral data. Name the compound molecular formula – $\text{C}_5\text{H}_{10}\text{O}$.
 IR – 1715 cm^{-1}
 PMR – 1.0δ (triplet, 6 H)
 2.4δ (quartet, 4 H)



TABLE - I
Characteristic Infrared Absorptions of Functional Groups

GROUP	FREQUENCY RANGE cm^{-1}	INTENSITY
A. Alkyl		
C-H (stretching)	2853 - 2962	(m - s)
Isopropyl - $\text{CH}(\text{CH}_3)_2$	1380 - 1385	(s)
	and 1365 - 1370	(s)
tert - Butyl - $\text{C}(\text{CH}_3)_3$	1385 - 1395	(m)
	and - 1365	(s)
B. Alkenyl		
C-H (stretching)	3010 - 3095	(m)
C = C (stretching)	1620 - 1680	(v)
R- $\text{CH} = \text{CH}_2$	985 - 1000	(s)
	and 905 - 920	(s)
$\text{R}_2\text{C} = \text{CH}_2$ (out of plane)	880 - 900	(s)
cis - $\text{RCH} = \text{CHR}$ C-H bendings)	675 - 730	(s)
trans - $\text{RCH} = \text{CHR}$	960 - 975	(s)
C. Alkynyl		
$\equiv \text{C-H}$ (stretching)	- 3300	(s)
$\text{C} \equiv \text{C}$ (stretching)	2100 - 2260	(v)
D. Aromatic		
Ar - H (stretching)	- 3030	(v)
Aromatic substitution type (C-H out-of-plane bendings)		
Monosubstituted	690 - 710	(very s)
	and 730 - 770	(very s)
o - Disubstituted	735 - 770	(s)
m - Disubstituted	680 - 725	(s)
	and 750 - 810	(very s)
p - Disubstituted	800 - 840	(very s)
E. Alcohols, Phenols, Carboxylic Acids		
OH (alcohols, phenols, dilute solutions)	3590 - 3650	(sharp v)
OH (alcohols, phenols, hydrogen bonded)	3200 - 3550	(broad s)
OH (carboxylic acids, hydrogen bonded)	2500 - 3000	(broad v)
F. Aldehydes, Ketones, Esters and Carboxylic Acids		
C = O stretch 1720	1630 - 1780	(s)
aldehydes - 1720 {Stre 2700 - 2900	1690 - 1740	(s)
ketones	1680 - 1750	(s)
esters	1735 - 1750	(s)
carboxylic acids	1710 - 1780	(s)
amides	1630 - 1690	(s)
G. Amines		
N - H	3300 - 3500	(m)
H. Nitriles		
$\text{C} \equiv \text{N}$	2220 - 2260	(m)



TABLE - 2
Approximate Proton Chemical Shifts in NMR

TYPE OF PROTON	CHEMICAL SHIFT, DELTA, PPM (δ)	
1° Alkyl, RCH_3	0.8 - 1.0	O
2° Alkyl, RCH_2R	1.2 - 1.4	
3° Alkyl, R_3CH	1.4 - 1.7	Ester $R - C - O - CH_2 - R$ 4 to 4.5
Allylic, $R_2C = C - CH_2$	1.6 - 1.9	N - CH_3 2.3
Benzylic, $ArCH_2$	2.2 - 2.5	
Alkyl chloride RCH_2Cl	3.6 - 3.8	
Alkyl bromide, RCH_2Br	3.4 - 3.6	
Alkyl iodide, RCH_2I	3.1 - 3.3	
Ether, $ROCH_2R$	3.3 - 3.9	
Alcohol, $HOCH_2R$	3.3 - 4.0	
Ketone, $RCCH_3$	2.1 - 2.6	
Aldehyde, RCH	9.5 - 9.6	
Vinyl, $R_2C = CH_2$	4.6 - 5.0	
Vinyl, $R_2C = CH$	5.2 - 5.7	
Aromatic, ArH	6.0 - 9.5	
Acetylenic, $RC \equiv CH$	2.5 - 3.1	
Alcohol hydroxyl, ROH	0.5 - 6.0*	
Carboxylic, $RCOH$	10 - 13*	
Phenolic, $ArOH$	4.5 - 7.7*	
Amino $R - NH_2$	1.0 - 5.0	

*The chemical shifts of these groups vary in different solvents and with temperature and concentration.

TABLE - 3
U.V. Absorption Rules for Diene Chromophores

1) Parent	215 nm	
2) Each extra conjugation	30 nm	
3) Homoannular	39 nm	
4) Exocyclic double bond	05 nm	-OH, -OR, Cl, Br 5 (nm)
5) Each alkyl (R) substituent directly attached to double bonded carbon	05 nm	-SR ₂ (30 nm), -NR ₂ (60 nm)

U.V. Absorption rules for Enone System

1) Parent	215 nm
2) Each extra conjugation	30 nm
3) Homoannular	39 nm
4) Substituents	
a) Alkyl group at α	10 nm
b) Alkyl group at β	12 nm
c) Alkyl group at γ, δ	18 nm

	α	β	γ
Cl	15	12	
OH, OR	35	30	
SR		85	
NR ₂		95	
O		75	
Acyl	6	6	6



Seat No.	
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B.Sc. – III (Semester – V) (Old) Examination, 2017
BOTANY (Special Paper – XI)
Genetics

Time : 2 Hours

Max. Marks : 50

- Instructions :** 1) **All questions are compulsory.**
2) **All questions carry equal marks.**
3) **Draw neat diagram wherever necessary.**
4) **Figures to the right indicate full marks.**

1. Rewrite the sentences choosing correct answer from given alternatives : **10**
- 1) From which animal Rh factor was discovered
A) Horse B) Mouse C) Rabbit D) Monkey
 - 2) Which individuals are called as universal recipients ?
A) O B) A C) AB D) B
 - 3) The number of chromosome in *Drosophila melanogaster* is
A) Six B) Eight C) Ten D) Twelve
 - 4) The sex chromosome in human male are known as
A) XX B) XY C) XO D) XZ
 - 5) The blood group in man was discovered by
A) Bateson B) Stern C) Landsteiner D) East
 - 6) _____ genes are present on homologous part of 'Y' chromosome which passed directly from father to son.
A) Hemophilia B) Holandric C) Hologenic D) Diandric
 - 7) Polytene chromosome first time observed by
A) Balbiani B) Painter C) Bridige D) Both A) and B)
 - 8) *26 Raphanobrassica* is a/an
A) Autopolyploid B) Allopolyploidy
C) Hexaploid D) None of the above
 - 9) Monosomy is depicted by
A) n B) $n - 1$ C) $2n - 1$ D) $2n - 2$
 - 10) The individuals having one chromosome extra to diploid genome are called
A) nullisomy B) trisomy C) tetrasomy D) monosomy

P.T.O.



2. Write **any five** of the following : **10**
- 1) What is self incompatibility in plants ?
 - 2) Why Drosophila is suitable material for genetic experiments ?
 - 3) What are blood groups in man ?
 - 4) What is holandric genes ?
 - 5) What is quantitative inheritance ?
 - 6) Define autosomes.
3. A) Write **any two** of the following : **6**
- 1) What is Polygene theory ?
 - 2) Describe in brief Haemophilia.
 - 3) Sex chromosome in Drosophila.
- B) Explain mechanism of sex determination in man. **4**
4. Write **any two** of the following : **10**
- 1) Describe Hardy-Weinberg's law.
 - 2) Explain plastid inheritance.
 - 3) Mitochondrial inheritance.
5. Write **any two** of the following : **10**
- 1) Explain Genic balance theory of sex determination by C.B. Bridge.
 - 2) Describe colour blindness in man.
 - 3) What is polyploidy ? What are different kinds of polyploidy explain with suitable example ?
-



Seat No.	
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B.Sc. III (Semester – V) (Old) Examination, 2017
ZOOLOGY (Special Paper – XI)
Comparative Anatomy of Chordates

Time : 2 Hours

Max. Marks : 50

Instructions : i) **All questions are compulsory.**
ii) **Figures to the right indicate full marks.**
iii) **Draw neat labelled diagram wherever necessary.**

1. Select the appropriate answer from **each** of the following and rewrite the sentence. **10**
- 1) Heterocochlear vertebrae are found in
a) amphibia b) birds c) reptiles d) mammals
 - 2) _____ have ruminant stomach.
a) Cat b) Dogs c) Tiger d) Cow
 - 3) Pecten is found in the eyes of
a) fishes b) birds c) mammals d) human being
 - 4) Cutaneous respiration found in _____ group of vertebrates.
a) reptilian b) amphibian c) aves d) mammals
 - 5) Heart of _____ shows highly reduced sinus venosus.
a) cartilage fishes b) boney fishes c) reptiles d) amphibians
 - 6) Claws are _____ derivatives of integument.
a) Epidermal hard b) Epidermal soft c) Dermal hard d) Dermal soft
 - 7) Three chambered heart is found in
a) Fisher b) Amphibians c) Aves d) Mammals
 - 8) Lungs of pigeon are provided with _____ air sacs.
a) Eight b) Nine c) One d) Four
 - 9) Central nervous system in vertebrates is derived from
a) basal plate b) neural plate c) blastopore d) pineal body
 - 10) Feathers are present in
a) fishes b) amphibian c) aves d) mammals



2. Answer **any five** of the following. 10
- 1) Gills of scoliodon
 - 2) Placoid scaler
 - 3) Skin of birds
 - 4) Metanephros kidney
 - 5) Cutaneous respiration in Amphibia
 - 6) Down feather
3. A) Answer **any two** of the following : 6
- 1) Air sacs in birds
 - 2) Pelvic girdle of reptiles
 - 3) Heart of scoliodon
- B) Evolutionary changes in brain of vertebrates. 4
4. Answer **any two** of the following : 10
- 1) Describe the respiratory organs in reptiles.
 - 2) Describe the fore gut in birds.
 - 3) Describe the mammary glands.
5. Answer **any one** of the following : 10
- 1) Give an account of soft glands in vertebrates.
 - 2) Describe brain of scoliodon and compare with that brain of frog.
-



Seat No.	
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B.Sc. – III (Semester – V) (Old) Examination, 2017
MATHEMATICS (Special Paper – XI)
Integral Calculus

Time : 2 Hours

Max. Marks : 50

Instructions: 1) *All questions are compulsory.*
2) *Figures to the right indicate full marks.*

1. Choose the correct alternative for each of the following :

10

1) $\int_a^b \frac{dx}{(x-a)^m}$ is convergent if

a) $m > 1$

b) $m = 1$

c) $m \geq 1$

d) $m < 1$

2) $\int_0^{\infty} \sin x \, dx$ is an improper integral of

a) First kind

b) Second kind

c) Third kind

d) Proper integral

3) $\int_a^{\infty} \frac{\sin x}{\sqrt{x}} \, dx$, where $a > 0$ is

a) Convergent

b) Divergent

c) Oscillatory

d) Proper

4) $\int_0^1 x^{m-1} (1-x)^{n-1} \, dx$ is convergent when

a) $m > 0$

b) $n > 0$

c) $m > 0, n > 0$

d) $m > 1, n > 1$



5) The value of $\int_0^1 x^4 (1-x)^3 dx$ is

- a) $\frac{1}{280}$ b) $\frac{1}{180}$ c) $\frac{1}{380}$ d) None of these

6) $\sqrt{\frac{1}{4}} \cdot \sqrt{\frac{3}{4}} =$

- a) π b) $\sqrt{2}$ c) $\sqrt{2}\pi$ d) $\frac{\pi}{\sqrt{2}}$

7) $\int_0^{\pi/2} \sqrt{\tan\theta} d\theta =$

- a) π b) $\frac{\pi}{2}$
c) $\frac{\pi}{\sqrt{2}}$ d) None of these

8) Value of $\int_1^2 \int_0^{\frac{1}{2}} y dy dx$ is equal to

- a) $\frac{1}{8}$ b) $\frac{1}{6}$ c) $\frac{2}{3}$ d) $\frac{7}{3}$

9) $\int_1^2 \int_0^{3y} y dy dx =$

- a) 3 b) 5 c) 7 d) 9

10) Area lying between the parabola $y = 4x - x^2$ and the line $y = k$ is

- a) $\frac{1}{2}$ unit b) 3 unit
c) $\frac{3}{2}$ unit d) $\frac{9}{2}$ unit



2. Attempt **any five** from the following :

10

1) Evaluate $\int_0^1 \int_{-\sqrt{y}}^{1-y^2} xy \, dx \, dy$.

2) Evaluate $\int_1^{\log 8} \int_0^{\log y} e^{x+y} \, dx \, dy$.

3) Evaluate $\int_0^{\infty} x^4 e^{-x} \, dx$.

4) Show that $\int_0^{\infty} x^3 e^{-x^3} \, dx = \frac{1}{9} \sqrt{\frac{1}{3}}$.

5) Test the convergence of $\int_0^1 \frac{dx}{x^7}$.

6) Define improper integrals of two kinds with suitable examples.

3. A) Attempt **any two** from the following :

6

1) Prove that the improper integral of first kind $\int_a^{\infty} \frac{dx}{x^p}$ converges if and only if $p > 1$.

2) Prove that $\beta(m, n) = 2 \int_0^{\pi/2} \sin^{2m-1} \theta \cdot \cos^{2n-1} \theta \, d\theta$.

3) Change the order of the double integral $\int_0^{4a} \int_{x^2/4a}^{2\sqrt{ax}} f(x, y) \, dy \, dx$.

B) Show that, every absolutely convergent integral is convergent.

4



4. Attempt **any two** from the following :

10

1) If $f(x)$ and $g(x)$ are positive and $\lim_{x \rightarrow \infty} \frac{f(x)}{g(x)} = L$, where L is non-zero finite number

then show that $\int_a^{\infty} f(x) dx$ and $\int_a^{\infty} g(x) dx$ behaves alike.

2) Prove that $\beta(p, q) = \frac{\Gamma(p) \Gamma(q)}{\Gamma(p+q)}$ and hence find $\Gamma\left(\frac{1}{2}\right)$.

3) Using the transformations $u = \frac{x^2 + y^2}{x}$, $v = \frac{x^2 + y^2}{y}$, evaluate

$\iint \frac{(x^2 + y^2)^2}{x^2 y^2} dx dy$ over the area common to the circles $x^2 + y^2 - ax = 0$ and $x^2 + y^2 - by = 0$.

5. Attempt **any two** from the following :

10

1) Change the order of integration and hence evaluate $\int_0^1 \int_0^{\sqrt{1-x^2}} \frac{y dx dy}{(1+y^2)\sqrt{1-x^2-y^2}}$.

2) State and prove duplication formula for gamma function and hence show that

$$\Gamma\left(\frac{1}{4}\right) \Gamma\left(\frac{3}{4}\right) = \sqrt{2} \pi.$$

3) State and prove Cauchy's test for convergence at ∞ and hence show that

$$\int_0^{\infty} \frac{\sin x}{x} dx \text{ is convergent.}$$



Seat No.	
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B.Sc. (Part – III) (Semester – V) (Old) Examination, 2017
STATISTICS (Special Paper – XI)
Probability Distributions and Stochastic Process

Time : 2 Hours

Max. Marks : 50

N.B. : i) **All questions are compulsory and carry equal marks.**
ii) **Use of scientific calculators and statistical tables is allowed.**

1. Choose most appropriate alternative : 10
- i) If X is Cauchy (10, 20) then $Q_2 =$ _____
a) 10 b) 30 c) 20 d) none of these
- ii) For Cauchy distribution coefficient of kurtosis γ_2 _____
a) is positive b) is negative c) is equal to 0 d) does not exist
- iii) In stochastic process the parameter space may be _____
a) Discrete b) Continuous c) a and b d) a or b
- iv) A stochastic matrix is one in which each _____ is 1.
a) Row sum b) Column sum
c) Diagonal element d) Off diagonal element
- v) If a r.v. X is truncated below 5 then $P(|X| > 5) =$ _____
a) $2P(X < 5)$ b) $P(X > 5)$ c) 1 d) 0
- vi) If $X \rightarrow$ Laplace (0, 1) then variance = _____
a) 1 b) 0.5 c) 2 d) none of these
- vii) Which of the following distributions is symmetric ?
a) lognormal b) truncated exponential
c) truncated binomial d) Laplace
- viii) Let (X, Y) is BN $(\mu_1, \mu_2, \sigma_1^2, \sigma_2^2, \rho)$ and $\sigma_1^2 > \sigma_2^2$ then $V[Y|X=x]$ _____
 $V[X|Y=y]$.
a) is greater than b) is equal to c) is less than d) is twice
- ix) Let (X, Y) is BN (0, 0, 1, 1, ρ) and $U = \frac{X}{Y}$ then $E(U) =$ _____
a) 0 b) ρ c) $1 - \rho$ d) can not be obtained

P.T.O.



x) The probability curve of LN (μ, σ^2) distribution inclines up to _____ and then declines.

- a) mean b) median c) mode d) Q_3

2. Attempt **any five** from the following : 10

- Write the pmf of truncated binomial distribution, truncated at $X = 0$.
- Write the pdf of lognormal (5, 9) distribution.
- Define absorbing state.
- Write the expression for r^{th} raw moment of lognormal (5, 9) distribution.
- Write the value of second raw moment of L (10, 20) distribution.
- Write the pdf of standard Cauchy distribution.

3. A) Attempt **any two** from the following : 6

- Show that for L (μ, λ) all odd ordered central moments vanish.
- Obtain the p.d.f. of truncated exponential (1) r.v., truncated below k.
- Let (X, Y) is BN $(\mu_1, \mu_2, \sigma_1^2, \sigma_2^2, \rho)$ write down the expressions a) for regressions of X on Y $E(XY)$, $E(X^2)$.

B) Give three features of stochastic matrix with illustration. 4

4. Attempt **any two** from the following : 10

- If X is C (0, 1) r.v. then find the distribution of X^2 .
- Let X and Y are i.i.d. exponential r.v.s with parameter λ . Then find the distribution of $X - Y$.
- If (X, Y) is a bivariate normal r.v. with pdf. $f(x, y) = K \exp \left[\frac{-1}{2}(x^2 + y^2) \right]_{-\infty < x, y < \infty}$ find K and all the parameters.

5. Attempt **any two** from the following : 10

- If X and Y are independent lognormal r.v.s with respective parameters (10, 25) and (5, 16) then find the distributions of $\frac{X}{Y}$.
- Let (X, Y) is BN $(\mu_1, \mu_2, \sigma_1^2, \sigma_2^2, \rho)$ then write down the expression for mgf and hence find $E(X)$, $E(Y^2)$, $\text{Cov}(X, Y)$.
- If X is C (0, 1) r.v. then find its CDF.



- ix) β -particles are
 a) positrons b) electrons c) protons d) neutrons
- x) Photons have _____
 a) positive charge b) negative charge c) both charges d) chargeless

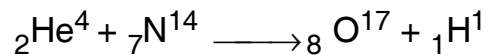
2. Answer **any five** of the following : **10**

- i) Define Mass defect.
- ii) Explain stripping reaction.
- iii) What is pickup reaction ?
- iv) Define α -disintegration energy.
- v) Explain Gravitational Interaction.
- vi) State betatron condition.

3. A) Answer **any two** of the following : **6**

- i) Write note on composition of nucleus.
- ii) Explain continuous nature of β -ray spectrum.
- iii) What is quarks ? Explain types of quark.

B) Calculate Q-value of the following reaction and indicate type of reaction. **4**



Given : Mass of ${}_2\text{He}^4 = 4.0038727$ a.m.u.

Mass of ${}_7\text{N}^{14} = 14.003074$ a.m.u.

Mass of ${}_8\text{O}^{17} = 16.999133$ a.m.u.

Mass of ${}_1\text{H}^1 = 1.007825$ a.m.u.

1 a.m.u. = 931 MeV.

4. Answer **any two** of the following. **10**

- i) Explain liquid drop model of nucleus.
- ii) Explain β -ray spectrometer and Neutrino hypothesis.
- iii) Explain the classification of elementary particles in brief.

5. Answer **any one** of the following. **10**

- i) Explain construction and working of cyclotron. What are the limitations of cyclotron ?
- ii) Explain construction and working of GM counter. Hence explain Geiger plateau region.



Seat No.	
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**B.Sc. (Part – III) (Semester – V) Examination, 2017
CHEMISTRY**

(Special Paper – XII) : Analytical and Industrial Physical Chemistry (Old)

Time : 2 Hours

Total Marks : 50

- Instructions :** 1) *All questions are compulsory.*
2) *Draw neat diagram and given equations wherever necessary.*
3) *Figures to the right indicate full marks.*

1. Choose the most correct alternative of the following and rewrite the sentences. **10**
- In total consumption burner _____ % of sample is used.
a) 5 b) 25 c) 95 d) 100
 - In electroplating _____ plays an important role.
a) electrolysis b) hydrolysis c) osmosis d) electrophoresis
 - The determination of _____ is the basic requirement of potentiometric titrations.
a) cell constant b) conductance
c) electrode potential d) transmittance
 - In a colorimetric measurements, the best filter is that which gives _____ absorption.
a) maximum b) minimum c) 100% d) none of these
 - The minimum external voltage required for continuous electrolytic deposition is known as
a) electrode potential b) cell potential
c) decomposition potential d) none of these
 - On dilution, the specific conductance
a) increases b) decreases
c) remains constant d) all of these
 - The Beer's law is usually represented by the equation
a) $I = I_0 10^{-\epsilon cx}$ b) $I = I_0 10^{\epsilon cx}$ c) $I = I_0 e^{-kx}$ d) $I = I_0 e^{kx}$
 - When temperature of the flame increases, the intensity of emitted radiation
a) increases b) decreases
c) remains constant d) become zero

P.T.O.



9) Determination of pH by using quinhydrone electrode is given by the expression

a) $\text{pH} = E_{\text{cell}} - 0.4540/0.0591$ b) $\text{pH} = 0.4540 - E_{\text{cell}}/0.0591$

c) $\text{pH} = 0.4540 + E_{\text{cell}}/0.0591$ d) $\text{pH} = E_{\text{cell}} + 0.4540/0.0591$

10) In a conductivity cell, the electrodes used are made up of

- a) copper b) zinc c) platinum d) gold

2. Answer **any five** of the following. **10**

- i) Give advantages of Laminar flow burner.
- ii) Explain the term throwing power.
- iii) Give the principle of Wheatstone bridge.
- iv) Why alternating current source is used in the conductivity measurements ?
- v) Mention advantages of glass electrode.
- vi) Give the statement of Lambert's law.

3. A) Answer **any two** of the following. **6**

- i) Write on Lundergraph burner.
- ii) Explain how organic substances like grease and oil removed from the articles to be plated.
- iii) State and explain Beer's law.

B) Write the answer of the following. **4**

Write advantages and limitations of quinhydrone electrode.

4. Answer **any two** of the following. **10**

- i) Discuss the electroplating equipments.
- ii) Describe photovoltaic cell with suitable diagram.
- iii) Discuss the applications of flame photometry.

5. Answer **any one** of the following. **10**

- i) Explain different types of conductivity cells used for measurement of conductance.
 - ii) Describe in detail the classical and analytical methods for locating end points by potentiometric technique.
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Seat No.	
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B.Sc. – III (Semester – V) (Old) Examination, 2017
MATHEMATICS
Partial Differential Equations (Special Paper – XII)

Time : 2 Hours

Max. Marks : 50

N.B. : 1) **All questions are compulsory.**
2) **Figures to the right indicate full marks.**

1. Choose the correct alternative for **each** of the following : **10**1) The general solution of the differential equation $yzp + zxq = xy$ is

- _____
- a) $\phi(x^2 - z^2, y^2 + 4z) = 0$ b) $\phi(x^2 + z^2, y^2 - 4z) = 0$
c) $\phi(x^2 - z^2, y - x) = 0$ d) $\phi(x - z, y + x) = 0$

2) If $z = f_1(x, a) + f_2(y, a) + b$ is the complete solution of the equation

- _____
- a) $f(p, q) = 0$ b) $f(z, p, q) = 0$
c) $f(x, p) = 9(y, q)$ d) $px + qy + f(p, q) = 0$

3) The first order partial differential equation

 $(x + y - z) \frac{\partial z}{\partial x} + (3x + 2y) \frac{\partial z}{\partial y} + 2z = x + y$ is _____ equation.

- a) Linear b) Quasi-linear c) Sem-linear d) Non-linear

4) C.F. of the equation $(D^2 + 5D D' + 6 D'^2) z = 0$ is _____

- a) $\phi_1(y - 2x) + \phi_2(y - 3x)$ b) $\phi_1(y + 2x) + \phi_2(y - 3x)$
c) $\phi_1(y - 2x) \phi \phi_2(y + 3x)$ d) $\phi_1(y + 2x) + \phi_2(y + 3)$

5) If $b \neq 0$, then C.F. of the equation of $(aD + bD' + c) z = 0$ is $Z =$ _____

- a) $e^{-\frac{cy}{b}} \psi(ax + by)$ b) $e^{\frac{cy}{b}} \psi(ay - bx)$
c) $e^{\frac{-cy}{b}} \psi(ay - bx)$ d) $e^{\frac{cy}{b}} \psi(ax + by)$



- 6) The complete integral of $\sqrt{p} + \sqrt{q} = 1$ is _____
- a) $z = ax + (1 - a^2) + c$ b) $z = ax + (a - 1)^2 y + c$
 c) $z = ax + (1 - a^2)y + c$ d) $z = ax + (1 - \sqrt{a})^2 y + c$
- 7) The singular integral of $px + qy + 5pq$ is _____
- a) $5z + x$ b) $5z + y$ c) $5z + xy$ d) $z + xy$
- 8) The value of $\frac{1}{D'^2} x^4 y^5$ is _____
- a) $\frac{x^4 y^6}{6}$ b) $\frac{x^5 y^5}{6}$ c) $\frac{x^6 y^5}{30}$ d) $\frac{x^4 y^7}{42}$
- 9) The particular integral of $(D - D'^2) z = e^{2x+3y}$ is $z =$ _____
- a) $\frac{1}{7} e^{2x+3y}$ b) $\frac{1}{7} e^{2x-3y}$ c) $-\frac{1}{7} e^{2x+3y}$ d) $-\frac{1}{7} e^{x-y}$
- 10) The equation $A \frac{\partial^2 z}{\partial x^2} + B \frac{\partial^2 z}{\partial x \partial y} + C \frac{\partial^2 z}{\partial y^2} = D$ is _____
- a) Non-homogeneous linear partial differential equation
 b) Homogeneous linear partial differential equation
 c) Homogeneous linear P.d. equation of order one
 d) None of these

2. Attempt **any five** of the following :

10

- 1) Eliminate arbitrary constants a and b from $z = (x - a)^2 + (y - b)^2$ to form the partial differential equation.
- 2) Solve $(mz - ny) p + (nx - lz) q = ly - mx$.
- 3) Find the complete integral of $pq = 1$, by Charpit's method.
- 4) Show that the differential equations $\frac{\partial z}{\partial x} = 5x - 7y$ and $\frac{\partial z}{\partial y} = 6x + 8y$ are not compatible.



5) Find the complementary function of the equation

$$(D^3 - 6D^2 D' + 11D D'^2 - 6D'^3) z = 0.$$

6) Find the complementary function of the equation

$$(D + D' - 1)(D + 2D' - 2) z = 0.$$

3. A) Attempt **any two** of the following :

6

1) Form a partial differential equation by eliminating the arbitrary functions f and g from $z = f(x^2 - y) + g(x^2 + y)$.

2) Explain the method of solving partial differential equations of the form

$$f(p, q, z) = 0, \text{ where } p = \frac{\partial z}{\partial x} \text{ and } q = \frac{\partial z}{\partial y}.$$

3) Solve $2r + 5s + 2t = 0$.

B) Solve $y^2p - xyq = x(z - 2y)$.

4

4. Attempt **any two** of the following :

10

1) Solve $\left\{ \frac{(b-c)}{a} \right\} yz p + \left\{ \frac{(c-a)}{b} \right\} zx q = \left\{ \frac{(a-b)}{c} \right\} xy$.

2) Find the complete integral, singular solution and general solution of the equation $z = px + qy + pq$.

3) If $F(D, D')$ be homogeneous function of D and D' of degree n , then

$$\frac{1}{F(D, D')} \phi^{(n)}(ax + by) = \frac{1}{F(a, b)} \phi(ax + by), \text{ provided } F(a, b) \neq 0, \phi^{(n)}$$

being the n^{th} derivative of ϕ w.r.to $ax + by$.

5. Attempt **any one** of the following :

10

1) Explain Lagrange's method of solving $Pp + Qq = R$ where P, Q and R are the functions of x, y and z and solve $p \tan x + q \tan y = \tan z$.

2) Explain Charpit's method of the solving partial differential equation

$$f(x, y, z, p, q) = 0, \text{ where } x \text{ and } y \text{ are independent variable and } p = \frac{\partial z}{\partial x}$$

$$\text{and } q = \frac{\partial z}{\partial y} \text{ and hence find the complete integral of } z = px + qy + p^2 + q^2.$$



- vii) When there is no defective in the lot, the OC function for $p = 0$ is
 a) $L(p) = 0$ b) $L(p) = 1$ c) $L(p) = \infty$ d) None of these
- viii) The probability of accepting a lot with rejectable quality level p is known as
 a) Consumer's risk b) Type I error
 c) Producer's risk d) None of these
- ix) The solution to a transportation problem with m -sources and n -destinations is non-degenerate, if the number of allocations are
 a) $m + n + 1$ b) $m + n$ c) $m + n - 1$ d) $m \times n$
- x) An assignment problem can be
 a) Designed and solved as a transportation problem
 b) Of maximization type
 c) Solved only if number of rows equals the number of columns
 d) All of these

2. Answer **any five** of the following :

10

- i) Define a LPP.
- ii) Define a surplus variable.
- iii) What is an unbalanced Assignment Problem ?
- iv) Define a critical path.
- v) What is a producer's risk ?
- vi) Define a pessimistic time of an activity.

3. A) Answer **any two** of the following :

6

- i) Write mathematical form of Assignment Problem.
- ii) Define solution, feasible solution and optimum solution of a L.P.P.
- iii) In a Single Sampling Plan if $N = 15000$, $n = 50$, $c = 2$, $p = 0.01$ and $P_a = 0.986183$, then calculate the average outgoing quality.

B) Convert the following L.P.P. in its standard form :

4

$$\text{Min } Z = x_1 + 1.5x_2$$

Subject to

$$x_1 + x_2 \geq 1$$

$$100x_1 + 10x_2 \geq 50$$

$$10x_1 + 100x_2 \geq 10$$

$$x_1 \geq 0, x_2 \geq 0$$



4. Answer **any two** of the following : 10

- i) Write a procedure of Matrix Minima (Least Cost) method.
- ii) The following assignment problem shows the costs of assigning four jobs to three machines. Determine the optimum assignment schedule.

		Machines		
		1	2	3
Jobs	A	80	40	20
	B	0	90	50
	C	30	80	90
	D	40	30	10

iii) Write a procedure of Single Sampling Plan.

5. Answer **any one** of the following : 10

- i) Find IBFS to the following transportation problem by using Vogel's Approximation Method.

		To				
		I	II	III	IV	
From	A	5	1	3	3	34
	B	3	3	5	4	15
	C	6	4	4	3	12
	D	4	-1	4	2	19
Demand		21	25	17	17	

ii) A project schedule has the following activities and the time (in days) of completion of each activity is as follows :

Activity	1-2	2-3	2-4	3-5	4-5
Time	170	115	100	216	130

Draw the network diagram. Find the minimum time of completion of the project, slack time of each activity and critical path.



Seat No.	
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B.Sc. – III (Semester – VI) (New-CGPA) Examination, 2017
ENGLISH (Compulsory)
Breakthrough

Time : 2.30 Hours

Max. Marks : 70

Instructions : 1) **All questions are compulsory.**
2) **Figures to the right indicate full marks.**

1. A) Choose the correct alternative : 10
- 1) Who said "Hello, old chap, you got to work, hey" ?
 - a) Jim
 - b) Ben Rogers
 - c) Tom
 - d) Billy Fisher
 - 2) Tom promises Jim to give _____ in exchange of whitewashing the fence.
 - a) a jews-harp
 - b) a tin soldier
 - c) a white alley
 - d) a spool cannon
 - 3) Mathilde does not want to go to the palace at the Ministry for party because _____.
 - a) she has no friends
 - b) she has no car to go by
 - c) she has no fancy clothes and jewels to wear
 - d) she is too tired to go
 - 4) Loisel gave Mathilde _____ to buy a petty dress for the party.
 - a) four hundred francs
 - b) three hundred francs
 - c) five hundred francs
 - d) six hundred francs
 - 5) Pyramus and Thisbe live resided in _____.
 - a) Rome
 - b) Greece
 - c) Sidon
 - d) Babylonia
 - 6) How did Pyramus and Thisbe communicate ?
 - a) through a crack in the wall
 - b) by whispering through the windows
 - c) standing outside
 - d) via letters and notes



- 7) What do maidens grind ?
- a) ginger, rosewood, turmeric b) sandalwood, henna, spice
c) beetroot, chilly, mustard d) potatoes, tomatoes, wheat
- 8) What do magicians chant ?
- a) notes into paper b) plate into spoon
c) gold into copper d) spells for the aeons to come
- 9) *Teach me a better strain, a nobler lay,
O Thou, enthroned with _____ in the realms of day!*
- a) Cherubs b) God c) Queen d) Virtue
- 10) According to poet Phillis Wheatley, wisdom is higher than _____ can reach.
- a) an angel b) a fool c) a wise d) a man

B) Do as directed :

4

- 1) My e-mail to Rita bounced back. (Make it a compound sentence)
- 2) Take care of the pence and the pounds will take care of themselves. (Change into a complex sentence)
- 3) She has been cooking all day. (Add a question tag)
- 4) This is the house. Sachin was born here. (Combine these sentences using relative adverb)

2. Answer **any seven** of the following questions in short.

14

- 1) Compare the myth of Pyramus and Thisbe to Shakespeare's '*Romeo and Juliet*'.
- 2) Do you think that Pyramus, and Thisbe are star-crossed lovers ? Justify your answer.
- 3) What action does Pyramus perform when he thinks Thisbe is dead ?
- 4) Does the story '*The Necklace*' have a moral ? What is it ?
- 5) Do you think that the course of action the Loiseles chose after the loss of the necklace was right ? What other choices were open to them ?
- 6) Comment briefly on the title of the story *The Necklace*.
- 7) Describe the character of Tom in '*Whitewashing the Fence*'.
- 8) What did Tom's friends do when they saw him painting the fence ?



3. A) Answer **any two** of the following : 8
- 1) Compare the bazaar described in the poem '*In the Bazaars of Hyderabad*' with today's shopping malls. What differences do you find between them ?
 - 2) What is the central idea of the poem '*On Virtue*' ?
 - 3) What is your own conception of heaven ? How, according to you, can we attain the kingdom of heaven ?
- B) Answer **any two** of the following : 6
- 1) Describe the strategies for managing the work stress with a suitable example.
 - 2) Write an example of a problem you have faced in the past. How did you solve it ?
 - 3) Write about the biggest change that you had to deal with. How did you adapt to that change ?
4. Imagine that you are walking through a lovely, dark and deep forest. Write a detailed description of the forest. 14

OR

Imagine that you are travelling by rail and you come across two orphan girls begging in the rail. Write an imaginative story of these two begging girls.

5. Read the following passage and write the summary of it. 14

Elimination of illiteracy has been one of the major concerns of our government since Independence. Illiteracy is a serious obstacle to the establishment of a social order based on equality. It withholds the development of the individual, society and the nation.

The position of our country as compared to that of vie literacy today is 90th in the world of the present trend continues, then we would be entering the twenty-first century with 55 crore illiterate-55 per cent of the total illiterates in the world or in other words, India would have a larger body of illiterate people than any other country in the world.

It was targeted to achieve 100 per cent literacy amongst those in the 15-35 age group during the Eighth Plan. This means that 10 crore additional people were to be educated. The Planning Commission in its approach paper to the Ninth Plan stated, keeping in view the declaration of education as a fundamental right, that making the nation fully literate by the year 2005 will be the committed goal.

The Hon. Prime Minister had put forward a suggestion that every student should impart literacy to five persons, including two girls to be able to qualify for the senior school certificates at the end of the plus-two course.



Seat No.	
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B.Sc. – III (Semester – VI) (New CGPA) Examination, 2017
PHYSICS (Special Paper – XI)
Electrodynamics

Time : 2½ Hours

Max. Marks : 70

- Instructions:** 1) **All questions are compulsory.**
2) **Figures to the right indicate full marks.**
3) **Draw neat diagrams wherever necessary.**
4) **Use of calculator and log tables is allowed.**

1. Select the correct alternative :

14

i) Electric field intensity \vec{E} in terms of scalar potential ϕ is given by

a) $\vec{E} = \nabla^2 \phi$

b) $\vec{E} = \frac{1}{\nabla \phi}$

c) $\vec{E} = -\nabla \phi$

d) $\vec{E} = -\frac{1}{\nabla \phi}$

ii) The trajectory of a charged particle entering an uniform magnetic field is a

a) Straight line parallel to \vec{B}

b) Parabola

c) Cycloid

d) Circle

iii) The cyclotron frequency (ω) of a charged particle in magnetic field (\vec{B}) depends upona) Magnetic field strength (\vec{B})b) Specific charge (q/m)

c) Both (a) and (b)

d) None of the above

iv) The trajectory of a charged particle in mutually perpendicular crossed electric and magnetic fields is

a) Cycloid

b) Circle

c) Helix

d) Parabola

v) Self inductance is measured in

a) Ohm

b) Farad

c) Weber

d) Henry



- vi) Self inductance per unit length of a long solenoid with n turns per unit length and cross-sectional area A is
- a) $\mu_0 n A$ b) $n^2 A$ c) $\mu_0 n^2 A$ d) $\mu_0^2 A$
- vii) Mathematical formulation of empirical laws in electricity and magnetism are known as
- a) Maxwell's equations b) Faraday's equations
c) Lorentz's equations d) Laplace's equations
- viii) Differential form of Ampere's circuital law is
- a) $\oint_C \vec{B} \cdot d\vec{l} = \mu_0 I$ b) $\nabla \times \vec{B} = \mu_0 \vec{J}$ c) $\nabla \times \vec{A} = \vec{B}$ d) $\nabla \times \vec{B} = \mu_0 \vec{J}$
- ix) Electric dipole moment per unit volume of polarized medium is called
- a) Displacement vector (\vec{D}) b) Polarization vector (\vec{P})
c) Magnetization (\vec{M}) d) Poynting's vector (\vec{N})
- x) Phase velocity of electromagnetic wave in non-conducting material medium is given by
- a) $v = \sqrt{\mu \epsilon}$ b) $v = \sqrt{\mu_0 \epsilon_0}$ c) $v = \frac{1}{\sqrt{\mu \epsilon}}$ d) $v = \frac{1}{\sqrt{\mu_0 \epsilon_0}}$
- xi) Propagation constant is given by
- a) $k = 2\pi\lambda$ b) $k = \frac{2\pi}{\lambda}$ c) $k = \frac{1}{2\pi\lambda}$ d) $k = \frac{\lambda}{2\pi}$
- xii) If refractive indices of glass and air are respectively 1.5 and 1 then value of transmission coefficient at the glass-air interface for normal incidence will be $T =$
- a) 0.96 b) 0.04 c) 1 d) 1.5
- xiii) To obtain total internal reflection, the wave must be incident
- a) From denser medium b) From rarer medium
c) Normally d) In any way
- xiv) An oscillating charge
- a) Radiates b) Does not radiate
c) Nothing can be said d) All of these



2. Answer **any seven** of the following : **14**
- i) Write Poisson's equation and give meaning of each term.
 - ii) Explain in brief electromotive force.
 - iii) Explain Lenz's law.
 - iv) Define surface current density \vec{K} .
 - v) State Poynting's theorem.
 - vi) Sketch the graphical representation of plane electromagnetic wave with usual notations.
 - vii) Define reflection coefficient of electromagnetic wave.
 - viii) What is retarded potential ?
3. A) Answer **any two** of the following : **10**
- 1) State and explain Ampere's law.
 - 2) Give an account of total internal reflection.
 - 3) Obtain the expression for total power radiated by an electric dipole.
- B) Calculate the radius of circular orbit of an electron of 5 keV in a magnetic field of 10^{-4} T. [Given $m = 9.1 \times 10^{-31}$ kg; $e = 1.6 \times 10^{-19}$ C and $1 \text{ e.v.} = 1.6 \times 10^{-19}$ J]. **4**
4. Answer **any two** of the following : **14**
- 1) Discuss the motion of a charged particle in constant, uniform electric field.
 - 2) State Maxwell's equations for vacuum and explain the physical significance of each equation.
 - 3) Obtain the boundary conditions for electromagnetic field vectors ($\vec{D}, \vec{E}, \vec{B}$ and \vec{H}) at the interface of two media.
5. Answer **any one** of the following : **14**
- 1) What is transformer ? Obtain the relation $\frac{\epsilon_2}{\epsilon_1} = \frac{N_2}{N_1}$.
 - 2) Obtain expression for skin depth for good conductor.

For sea water; $\sigma = 4.2$ mho/m at a frequency of 50 kHz. Calculate the skin depth. Given $\mu = 4\pi \times 10^{-7}$ H/m.



Seat No.	
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B.Sc. – III (Semester – VI) (New – CGPA) Examination, 2017
CHEMISTRY (Special Paper – XI)
Physical Chemistry

Time : 2.30 Hours

Max. Marks : 70

- N.B. :** 1) **All questions are compulsory.**
2) **Figures to the right indicate full marks.**
3) **Neat diagrams must be drawn whenever necessary.**
4) **Use of logarithmic table/scientific calculator is allowed.**

1. Choose the most correct alternative and write the sentence : **14**
- i) Rotational spectra of diatomic molecules are observed in _____ region.
a) Visible b) Far infrared c) Microwave d) X-ray
- ii) The energy E_0 of a oscillating molecule in its lowest vibration is _____
a) $\frac{1}{2}hc\bar{\omega}_0$ b) $hc\bar{\omega}_0$ c) $\frac{2}{3}hc\bar{\omega}_0$ d) $2hc\bar{\omega}_0$
- iii) For rotational transitions selection rule is _____
a) $\Delta J = \pm 1$ b) $\Delta J = \pm 2$ c) $\Delta J = \pm 3$ d) $\Delta J = \pm 4$
- iv) Rotational spectrum consists of series of equally spaced lines with a separation of _____
a) $4\bar{B}$ b) $3\bar{B}$ c) $2\bar{B}$ d) $1\bar{B}$
- v) The fundamental equation in the spectroscopy is _____
a) $\Delta V = hv$ b) $\Delta J = hv$ c) $\Delta S = hv$ d) $\Delta E = hv$
- vi) In the formation of ideal solution, volume is exactly _____ to the sum of the volumes of the components.
a) Half b) Double c) Equal d) Unequal
- vii) Liquid mixture which boils at constant temperature without change in its composition is called _____ mixture.
a) Zeotropic b) Azeotropic c) Fractional d) None of these



- viii) The equation $W_{\max} = RT \ln K_p + \Delta n RT$ represents _____
- a) Gibbs-Helmholtz equation b) Van't-Hoff isochore
c) Clapeyron equation d) Van't-Hoff isotherm
- ix) At constant pressure and temperature change in free energy for non-spontaneous process is _____
- a) Positive b) Negative c) Zero d) None of these
- x) The equation $\Delta G = \Delta H + T \left(\frac{d\Delta G}{dT} \right)_P$ represents _____ equation.
- a) Arrhenius b) Kirchhoff's
c) Gibb's-Helmholtz d) Clapeyron
- xi) $\text{mol}^{-2} (\text{dm}^3)^2 \text{sec}^{-1}$ are the units of _____ order reactions.
- a) First b) Second c) Third d) Zero
- xii) The half life period of third order reaction is _____ proportional to square of the initial concentration of the reactants.
- a) Directly b) Inversely c) Indirectly d) None of these
- xiii) $A + B + C \rightarrow \text{product}$ is an example of _____ reaction.
- a) First b) Second c) Third d) Pseudo
- xiv) Minimum energy required for molecules to react is called _____ energy.
- a) Activation b) Potential c) Kinetic d) Nuclear

2. Solve **any seven** of the following :

14

- i) What is isotopic effect in diatomic molecules ?
- ii) What are the applications of rotational spectra ?
- iii) Define ideal and non ideal solutions.
- iv) Discuss vapour pressure of ideal solutions.
- v) Define fugacity and activity of a substance.
- vi) What is law of mass action ?
- vii) What do you mean by chain reactions ?
- viii) Discuss the temperature coefficient.
- ix) What are side reactions ?



3. A) Write notes on **any two** of the following : **10**
- i) Describe in brief rotational spectra of diatomic molecules.
 - ii) Discuss the distillation of solutions with the system having boiling point maximum.
 - iii) Explain collision theory of energy of activation.
- B) One mole of an ideal gas is expanded isothermally and reversibly from a pressure of 2.295 N-m^{-2} to 0.749 N-m^{-2} . Calculate the change in free energy for the process. ($R = 8.314 \text{ JK}^{-1}\text{mol}^{-1}$). **4**
4. Attempt **any two** of the following : **14**
- i) What are partially miscible liquids ? Explain with an example the partially miscible liquids with maximum consolute temperature.
 - ii) Derive thermodynamically Van't Hoff reaction isotherm.
 - iii) Explain Arrhenius's equation and derive the equation of energy of activation.
5. Attempt **any two** of the following : **14**
- i) Explain in detail the vibrational spectra of diatomic molecules.
 - ii) The equilibrium constant K_p for a reaction at 643 K is 3.3×10^{-4} and at 703 K is 8.6×10^{-5} . Calculate the enthalpy change for the reaction ($R = 8.314 \text{ JK}^{-1}\text{mol}^{-1}$).
 - iii) Derive an expression for third order reactions. What are the units of third order reaction ? Give example of third order reaction.
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Seat No.	
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B.Sc. (Part – III) (Semester – VI) (New CGPA) Examination, 2017
BOTANY (Special Paper – XI)
Microbiology and Plant Pathology

Time : 2½ Hours

Total Marks : 70

- Instructions:** I) **All questions are compulsory.**
II) **All questions carry equal marks.**
III) **Draw neat and labelled diagrams wherever necessary.**
IV) **Figures to the right indicate full marks.**

1. Rewrite the following sentences by choosing correct alternative. **(1×14=14)**
- 1) Separation of microbes from the mixed culture is known as
a) Isolation b) Incubation c) Dilution d) None of these
 - 2) A culture that contains unknown ingredients is called as _____ medium.
a) Artificial b) Natural c) Synthetic d) Semisynthetic
 - 3) Serial dilution method helps to _____ the microbes.
a) Sterilize b) Isolate c) Incubate d) None of these
 - 4) Prokaryotic microbes include
a) Bacteria b) Mycoplasma c) BGA d) All the above
 - 5) In microbial fermentation, useful _____ are generally used.
a) Bacteria b) Fungi c) Mycoplasma d) Both a) and b)
 - 6) Bangadi disease is the example of _____ disease.
a) Bacterial b) Viral c) Fungal d) Phytoplasma
 - 7) _____ is the third largest alcohol producer in the world.
a) India b) Iran c) Kenya d) China
 - 8) Grain smut of jowar disease is caused by _____ sp.
a) *Sclerospora* b) *Sphacelotheca*
c) *Colletotrichum* d) *Cercospora*



- 9) In India, _____ percent of milk is converted into dairy products.
a) 90 b) 47 c) 70 d) 80
- 10) Shoyu sauce is the famous food of
a) India b) China
c) Japan d) Both b) and c)
- 11) Alexander Fleming discovered the famous drug penicillin in
a) 1947 b) 1927 c) 1948 d) 1930
- 12) Idly is prepared by fermentation from
a) Rice b) Black gram
c) Peanuts d) Both a) and b)
- 13) There occurs excessive cell divisions and enlargement is the _____ symptoms.
a) Necrotic b) Hypertrophy c) Atrophy d) All the above
- 14) Curd contains about _____ different antibiotics which are useful for stomach disorders.
a) 10 b) 20 c) 30 d) 35

2. Answer **any seven** of the following :

(7×2=14)

- I) Define plant pathogen.
- II) Write symptoms of anthracnose of bean.
- III) What is incubation ?
- IV) Define pesticides.
- V) Name any two fungi involved in citric acid production by fermentation.
- VI) Define mycoplasma.
- VII) Write uses of Gibberellic acid.
- VIII) Give the control measures of Tikka disease.
- IX) What is seed dressing ?



3. A) Answer **any two** of the following : **(2×5=10)**
- I) Explain the chemical sterilization studied by you.
 - II) Give the symptoms and control measures of Bangadi disease of potato.
 - III) Describe the classification of culture media based on chemical composition.
- B) Write the isolation of fungi by serial dilution method. **4**
4. Answer **any two** of the following : **(2×7=14)**
- I) Describe the general characters of algae as microbes.
 - II) Classify plant diseases based on necrotic symptoms.
 - III) Explain the method of preparation of cheese and uses.
5. Answer **any two** of the following : **(2×7=14)**
- I) Give the symptoms, causal organism and control measures of green ear disease of bajra.
 - II) Describe the sources and uses of mycopesticides.
 - III) Give the method of production of alcohol by fermentation and state its uses.
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Seat No.	
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B.Sc. – III (Semester – VI) Examination, 2017
ZOOLOGY (Special Paper – XI) (New CGPA)
Physiology

Time : 2.30 Hours

Total Marks : 70

- N.B.** 1) *All questions are compulsory.*
2) *Draw neat labeled diagrams wherever necessary.*
3) *Figures to right indicate full marks.*

1. Complete the sentence selecting **appropriate** answer. **14**

- 1) The emulsification of fat is carried by _____ juice.
a) Bile b) Intestinal c) Gastric d) Pancreatic
- 2) Blood pressure in healthy person is _____ mmhg.
a) 90/60 b) 120/80
c) Both a and b d) None of the above
- 3) One cardiac cycle required _____ time.
a) 0.4 sec b) 0.2 sec
c) 0.3 sec d) 0.8 sec
- 4) Hamberger phenomenon is called _____ Shift.
a) Phosphate b) Nitrate
c) Chloride d) Carbonate
- 5) O₂ is carried from lung to each cell of human body in combination with _____
a) Haemoglobin b) Heparin
c) Melanin d) Tannin
- 6) _____ is called antisterility vitamin.
a) Vit K b) Vit E
c) Vit A d) Vit D



- vi) Physiological role of vitamin E.
- vii) Transamination.
- viii) Dialysis.
- ix) Diagram of nerve cell.

3. A) Answer **any two** of the following : **10**

- i) Vitamin D sources and importances.
- ii) Structure of malpighian body.
- iii) Cardiac cycle.

B) Give in detailed structure of striated muscle. **4**

4. Answer **Any two** of the following : **14**

- i) Describe Kreb's cycle.
- ii) Describe normal composition of urine.
- iii) Describe the origin and conduction of heart beat.

5. Answer **Any two** of the following : **14**

- i) Describe the process of gastric digestion.
 - ii) Discuss vitamin A- Sources, physiological importance and deficiency.
 - iii) What is respiration ? How the transport of O₂ is carried out in human body ?
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Seat
No.

B.Sc. – III (Semester – VI) (New) (CGPA) Examination, 2017
MATHEMATICS (Special Paper No. – XI)
Metric Spaces

Time : 2½ Hours

Max. Marks : 70

N.B : i) *All questions are compulsory.*
ii) *Figure to the right indicates full marks.*

1. Choose correct alternatives for **each** of the following : **14**
- 1) If ρ is metric on M then 2ρ is _____ on M .
a) metric b) metric space c) discrete metric d) usual metric
 - 2) If $\left\{\frac{1}{n}\right\}$ is convergent sequence converging to _____ in \mathbb{R} with the usual metric.
a) 1 b) 2 c) 0 d) None of these
 - 3) If a Cauchy sequence has a convergent subsequence, then whole sequence is
a) divergent b) convergent c) both a) and b) d) none of these
 - 4) A subset A of X is said to be bounded if there exists a positive real number M such that
a) $d(x, y) = M \forall x, y \in A$ b) $d(x, y) \leq M, \forall x, y \in A$
c) $d(x, y) \geq M \forall x, y \in A$ d) $d(x, y) \leq M \forall x, y \notin A$
 - 5) Finite intersection of open sets of metric space is
a) open b) closed c) open and closed d) none of these
 - 6) The real valued function f is continuous at $a \in \mathbb{R}'$ if
a) $f^{-1}(B[a; \delta]) \supset B[f(a); \epsilon]$ b) $f^{-1}(B[f(a); \epsilon]) \supset B[a; \delta]$
c) $f^{-1}(B[f(a); \delta]) \subset B[a; \epsilon]$ d) None of these



- 3) Prove that the interval $[a, b)$ neither open nor closed.
- 4) If $T : X \rightarrow X$ is defined as $T_x = x^2$ where $x \in \left[0, \frac{1}{3}\right)$ then prove that T is contraction on $\left[0, \frac{1}{3}\right)$.
- 5) Define totally bounded set.
- 6) Show that every finite subset of metric space is totally bounded.
- 7) Let E be a closed and bounded then set E in \mathbb{R} with absolute value metric then prove that it is compact.
- 8) If A is a closed subset of compact metric space (X, d) then prove that the metric space (A, d) is compact.
- 9) Let A be subset of metric space (M, ρ) , if (A, ρ) is compact then prove that A is closed subset of (M, ρ) .

3. A) Attempt **any two** of the following : 10

- 1) Let (M, ρ) be metric space and let a be point in M . If $\lim_{x \rightarrow a} f(x) = L$ and $\lim_{x \rightarrow a} g(x) = N$ then prove that $\lim_{x \rightarrow a} (f(x).g(x)) = L.N$.
- 2) If $x = (x_1, x_2), y = (y_1, y_2)$ are any two points in \mathbb{R}^2 we can define metric $\rho(x, y) = \max \{ |x_1 - y_1|, |x_2 - y_2| \}$. Prove that (\mathbb{R}^2, ρ) is metric space.
- 3) If f and g are real valued function, if f is continuous at 'a' and g is continuous at 'f(a)'. Prove that $g \circ f$ is continuous at 'a'.

B) If E is any subset of metric space M , then prove that \bar{E} is closed. 4

4. Attempt **any two** of the following : 14

- 1) If G_1 and G_2 are open subset of metric space M , then prove that $G_1 \cap G_2$ is also open.
- 2) Prove that \mathbb{R}^2 is complete metric space.
- 3) Let (M, ρ) be complete metric space, if T is contraction on M , then prove that their is one and only one point x in M such that $T_x = x$.



5. Attempt **any two** of the following :

14

1) Let (M, ρ) be complete metric space for each $N \in \mathbb{I}$. Let F_n be the closed and bounded subset of M , such that

a) $F_1 \supset F_2 \supset F_3 \supset \dots \supset F_n \supset F_{n+1} \supset \dots$

b) $\text{dia } F_n \rightarrow 0$ as $n \rightarrow \infty$ then prove that $\bigcap_{n=1}^{\infty} F_n$ contains precisely one point.

2) If F_1 and F_2 are closed subset of metric space M , then prove that $F_1 \cup F_2$ is closed.

3) State and prove Schwartz Inequality theorem.



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B.Sc. – III (Semester – VI) (New – CGPA) Examination, 2017
STATISTICS (Special Paper – XI)
Statistical Inference – II

Time : 2½ Hours

Max. Marks : 70

Instructions : 1) **All questions are compulsory.**
2) **All questions carry equal marks.**

1. Choose the correct alternative : **14**
- 1) If it is known that 95% LCL and UCL to population mean are 48.04 and 51.96 respectively. What is the value of population variance when the sample size is 100 ?
a) 64 b) 100 c) 144 d) 200
 - 2) If $(1 - \alpha)$ is increased, the width of confidence interval is
a) decreased b) increased
c) constant d) cannot be determined
 - 3) A wrong decision about null hypothesis leads to
a) Type I error b) Type II error
c) Both a) and b) d) Cannot be determined
 - 4) The power function of a test is related to
a) Type – I b) Type – II
c) Both a) and b) d) None of these
 - 5) Critical region provides us the criteria for _____ of null hypothesis.
a) Acceptance b) Rejection c) No decision d) None of these
 - 6) In a random variable X has $N(\mu, \sigma^2)$, then which of the following is a simple null hypothesis ?
a) $\mu = 0$ b) $\mu < 0$ c) $\mu > 0$ d) $\mu \neq 0$
 - 7) Neyman-pearson lemma provides
a) an unbiased test b) most powerful test
c) an admissible test d) minimax test

P.T.O.



- 8) The UMP criterion gives the BCR for testing.
- simple H_0 against simple H_1
 - simple H_0 against composite H_1
 - composite H_0 against composite H_1
 - any type of hypothesis
- 9) The choice of one tailed or two tailed test depends on
- null hypothesis
 - alternative hypothesis
 - both a) & b)
 - none of these
- 10) Which of the following statement is false ?
- Parametric test are not applicable to nominal data
 - NP-lemma provides MP-test
 - In SPRT the size of sample is random
 - Mann Whitney test is parametric test
- 11) Range of likelihood ratio test statistics is
- $(-\infty, \infty)$
 - $(0, \infty)$
 - $(-1, 1)$
 - $(0, 1)$
- 12) If there are 16 symbols of two types in number the minimum possible number of runs is,
- 2
 - 4
 - 6
 - 8
- 13) Ordinary sign test consider the difference of observed values from the hypothetical median value in terms of
- signs only
 - magnitudes only
 - sign and magnitude both
 - none of the above
- 14) Randomness of a sequence through runs test is decided by comparing the observed no. of runs with
- Z value
 - t value
 - two critical values
 - none of the above

2. Attempt **any seven** :

14

- Define a simple and composite hypothesis.
- Define power of a test.
- State properties of likelihood ratio.
- What are the merits of nonparametric tests ?
- What is confidence interval ?
- What are the critical values of SPRT tests ?



- 7) What is the test statistics for Wilcoxon’s signed-Rank test ?
- 8) Obtain confidence interval for population mean when sample if size 100 is drawn from $N(\mu, 25)$ with 5% level of significance.

3. A) Attempt **any two** : 10

- 1) A sample of size n from normal distribution $N(\theta, \sigma^2)$ with $\sigma^2 = 4.95\%$ confidence interval for θ was computed from above sample. Find the value of n if the confidence interval is (9.02, 10.98).
- 2) Explain in short the sign test for paired sample.
- 3) Let x_1, x_2, \dots, x_n be a random sample from a distribution with pdf $f(x, \theta) = \theta x^{\theta-1}$ $0 < x < 1$ obtain the best critical region for testing $H_0 : \theta = 1$ against $H_1 : \theta = 2$.

B) An urn contains 10 marbles of which θ are white and the rest are black. To test the hypothesis. 4

$H_0 : \theta = 5$ against $H_1 : \theta = 4$ the following test is suggested. Take two marbles at random without replacement and reject H_0 if they are of different colours. Determine the size of the critical region.

4. Attempt **any two** : 14

- 1) Show that the likelihood ratio test leads to t-test for testing $H_0 : \mu = \mu_0, 0 < \sigma^2 < \infty$ against $H_1 : \mu \neq \mu_0, 0 < \sigma^2 < \infty$ in case of $N(\mu, \sigma^2)$ distribution where μ_0 is specified.
- 2) State and prove Neyman Pearson Lemma.
- 3) Explain Median Test for two independent samples.

5. Answer **any two** : 14

- 1) Obtain SPRT for testing $H_0 : \lambda = \lambda_0$ against $H_1 : \lambda = \lambda_1$ Where λ is a parameter of Poisson distribution.
 - 2) Obtain $100(1-\alpha) \%$ confidence interval for σ_1^2 / σ_2^2 when two independent random samples of sizes m and n drawn from $N(\mu_1, \sigma_1^2)$ and $N(\mu_2, \sigma_2^2)$ μ_1, μ_2 are unknown.
 - 3) Define UMP test. Construct a UMP test of size a for testing $H_0 : \theta = \theta_0$ against $H_1 : \theta > \theta_0$ based on a sample of size n from an exponential distribution with parameter θ .
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B.Sc. (Part – III) (Semester – VI) (New CGPA) Examination, 2017
GEOLOGY
(Special Paper – XI)
Crystallography, Principles of Stratigraphy and Earth's History

Time : 2.30 Hours

Total Marks : 70

- Instructions :** 1) *All questions are compulsory.*
2) *Figures to the right indicate full marks.*
3) *Draw neat diagrams wherever necessary.*

1. Fill in the blanks with **correct** answer from the given options. **14**
- 1) There are _____ elements of symmetry to describe any crystal.
a) 2 b) 3
c) 4 d) 1
- 2) Angle between two adjacent faces is _____ angle.
a) Apex b) Interfacial
c) Acute d) Obtuse
- 3) Two faces of a crystal meet to form an _____
a) Corner b) Solid angle
c) Center d) Edge
- 4) Faces of pyramid essentially _____ the vertical axis.
a) Parallels b) Cuts
c) Horizontal d) Equals
- 5) Hexagonal Prism has _____ faces.
a) 2 b) 3
c) 4 d) 6

P.T.O.



2. Answer **any seven** of the following : **14**
- 1) What is lithostratigraphy ?
 - 2) What is Unconformity ?
 - 3) What is solid angle of crystal ?
 - 4) Describe pinacoid.
 - 5) Draw and describe tris-octahedron.
 - 6) What is solid angle of crystal ?
 - 7) What is Eon ?
 - 8) Define age.
 - 9) What is stage ?
3. A) Answer **any two** of the following : **10**
- 1) Define and describe dihexagonal prism.
 - 2) Define and describe 1st and 2nd order pyramids of Orthorhombic System.
 - 3) Describe axes characteristics of Hexagonal System Models.
- B) Write answer of **any one** of the following : **4**
- 1) Describe Trapezohedron, draw figure.
 - 2) Describe use of marker bed in stratigraphy.
4. Answer **any two** of the following : **14**
- 4) Describe in detail the elements of symmetry of Tetragonal System.
 - 5) Describe in details Prisms of Hexagonal System Crystals. Draw neat diagrams.
 - 6) Describe the principle of uniformitarianism. Give example.
5. Answer **any two** of the following : **14**
- 1) Define Octahedron Draw Hex-octa hedron and describe it.
 - 2) Describe the Geological Time Scale.
 - 3) Draw diagram showing correlation of rocks with the help of Index Fossil, explain it.
-



- 7) Maxam and Gilbert method is used for
A) DNA finger printing B) DNA sequencing
C) Gene mapping D) Gene cloning
- 8) The plasmid vectors that are specifically designed to replicate in two different hosts are called
A) Cosmid B) Plasmid C) Shuttle vector D) Replacement vector
- 9) Lac-operon has _____ genes.
A) z, y and a B) x, y and z C) z, x and y D) z, y and b
- 10) _____ enzyme removes phosphate group from 5' end of DS/SS DNA or RNA.
A) Acid phosphatase B) Phosphatidyl transferase
C) Alkaline phosphatase D) Exonuclease
- 11) _____ type of gel electrophoresis most commonly used for separation of large DNA fragments.
A) PAGE B) SDS PAGE C) Agarose D) 2DPAGE
- 12) DNA fingerprinting technique was developed by
A) Francis crick B) H. Khurana C) Alec Jeffrey D) James Watson
- 13) Genetic complementation test in the rII region of phage T4 developed by
A) S. Benzer B) S. Altman C) Griffith D) Watson
- 14) For DNA fingerprinting _____ used as marker.
A) RAPD B) AFLP C) VNTR D) RFLP

2. Answer **any seven** of the following :

14

- i) What are macrolesions ?
- ii) What is recombinant DNA ?
- iii) Define Cosmid.
- iv) What is Electrophoresis ?
- v) What are adapters ?
- vi) What are frame shift mutations ?
- vii) What is cAMP ? Give its significance.
- viii) What is intergenic suppression ?
- ix) Give the mode of action of DNA polymerase I.



3. A) Answer **any two** of the following : 10
- a) Draw a labelled diagram of pBR322.
 - b) Discuss in detail positive regulation of Lac operon.
 - c) Give brief account of missense mutations.
- B) Write briefly on Applications of protein engineering. 4
4. Answer **any two** of the following : 14
- i) Discuss briefly the “Cis Trans test”.
 - ii) Give brief account of DNA finger printing.
 - iii) What is role of Sigma factor of RNA polymerase ? Discuss in detail Mechanism of transcription.
5. Write in short on **any two** of the following : 14
- i) Discuss briefly structural organization of *E.coli* chromosome.
 - ii) Discuss briefly Phenotypic lag.
 - iii) Describe briefly the mechanism of DNA replication.
-



- vii) In half wave controlled rectifiers the load power can be controlled in only _____ of the input ac supply.
- a) 90° b) 180° c) 270° d) 360°
- viii) _____ is used for DC power to AC power conversion.
- a) Inverter b) Chopper c) Rectifier d) Amplifier
- ix) The dutycycle of chopper is
- a) $T_{on} + T_{off}$ b) $\frac{T_{off}}{T_{on}}$ c) $\frac{T_{on}}{T_{on} + T_{off}}$ d) $\frac{T_{on} + T_{off}}{T_{off}}$
- x) SMPS means _____ power supply.
- a) Single Mode b) Switched Mode
c) Series Mode d) Shunt Mode
- xi) A PUT is generally used in
- a) A rectifier circuit b) Power amplifier
c) Sawtooth oscillator d) All of these
- xii) _____ is a heart of inverter.
- a) Oscillator b) Step up transformer
c) Rectifier d) Filter
- xiii) _____ is used to convert DC power to DC power.
- a) Chopper b) Inverter c) Oscillator d) Amplifier
- xiv) If firing angle is α then conduction angle in case of SCR is _____ degrees.
- a) 0 b) 90 c) 180 d) $180 - \alpha$

2. Answer **any seven** of the following :

14

- i) Explain need of heat sink.
- ii) Draw equivalent circuit of IGBT.
- iii) Why controlled rectifiers are used ?
- iv) State typical applications of inverter.
- v) Define chopper.



- vi) Draw the constructional diagram and symbol of PUT.
 - vii) State advantages of power diode.
 - viii) Draw the output waveforms of single phase half wave rectifier with inductive load.
 - ix) State the principle of DC motor.
3. A) Answer **any two** of the following : **10**
- i) Explain class A commutation method for SCR.
 - ii) Explain protection circuit for $\frac{dv}{dt}$ of SCR.
 - iii) Write a short note on UPS.
- B) Explain working of series inverter. **4**
4. Answer **any two** : **14**
- i) Explain construction and switching characteristics of power MOSFET.
 - ii) Describe single phase half wave controlled rectifier with inductive load.
 - iii) Explain working of Mc Murray Bedford inverter.
5. Answer **any two** : **14**
- i) Describe RC triggering method of SCR along with its waveforms.
 - ii) With the help of neat circuit diagram explain operation of Jone's chopper.
 - iii) Draw circuit diagram of single phase full wave controlled rectifier with resistive load.
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B.Sc. – III (Semester – VI) (New-CGPA) Examination, 2017
COMPUTER SCIENCE (Special Paper – XI)
Web Technology

Time : 2½ Hours

Max. Marks : 70

N. B. : 1) **All questions are compulsory.**
2) **Figures to the right indicate full marks.**

1. Choose correct alternatives :

14

- 1) _____ method is invoked on the DataAdapter control to load your generated dataset with data.
 - a) Load()
 - b) Fill()
 - c) DataList
 - d) DataBind
- 2) The first event triggers in an aspx page is _____.
 - a) Page_Init()
 - b) Page_Load()
 - c) Page_click()
 - d) Page_Unload()
- 3) Attribute must be set on a validator control for the validation to work _____.
 - a) ControlToValidate
 - b) ControlToBind
 - c) ValidateControl
 - d) Validate
- 4) An alternative way of displaying text on web page using _____.
 - a) asp:button
 - b) asp:listitem
 - c) asp:label
 - d) Asp:Image
- 5) Default Session data is stored in ASP.Net using _____.
 - a) StateServer
 - b) Session Object
 - c) InProcess
 - d) All of the above



- 6) _____ control is used to validate that two fields are equal.
- a) RegularExpressionValidator b) CompareValidator
c) equals() method d) RequiredFieldValidator
- 7) We can have only one Global.asax file per project.
- a) Yes b) No
- 8) The .NET Framework provides a runtime environment called _____
- a) RMT b) CLR
c) RCT d) RC
- 9) _____ is the base class from which all Web forms inherits.
- a) Master Page b) Page Class
c) Session Class d) None of the Above
- 10) The default event for textbox control is _____
- a) Textchanged b) CheckedChanged
c) Click d) Command
- 11) _____ is the form in which postback occurs.
- a) Html b) Web form
c) Win from d) None of these
- 12) _____ manages the states in asp.net application.
- a) Session and Application object b) View state
c) Cookies d) All
- 13) The _____ control provides to display different image on page each time it is loaded.
- a) Repeater b) Image
c) ImageMap d) Adrotator
- 14) _____ is an application folder.
- a) Bin b) App_theme
c) None d) Both a) and b)



2. Answer the following **(any seven)** : **14**
- 1) Explain Regular Expression Validator.
 - 2) Write short note on CLR.
 - 3) What are Web server controls in ASP.NET ?
 - 4) What are the Asp.net Page structure options ?
 - 5) Explain stored procedure.
 - 6) Explain @Master Directive.
 - 7) List the different Application folders in ASP.NET.
 - 8) Explain Dataset.
 - 9) List various types of server side state management system.
3. A) Answer the following **(any two)** : **10**
- 1) Explain ASP.NET Page Life Cycle.
 - 2) What is meant by cross page posting explain with example ?
 - 3) Explain login controls.
- B) Explain AdRotator control with example. **4**
4. Answer the following **(any two)** : **14**
- 1) Explain various client side state management with example.
 - 2) Explain DataReader and DataAdapter with example.
 - 3) Write a short note on Master page.
5. Answer the following **(any two)** : **14**
- 1) What are the validation controls available in ASP.NET ? Explain with example.
 - 2) What is page directives ? Explain different page directives.
 - 3) Explain ASP.Net compilation technique in detail.
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B.Sc. – III (Semester – VI) (New) (CGPA) Examination, 2017
PHYSICS (Special Paper – XII)
Material Science

Time : 2½ Hours

Max. Marks : 70

- N.B. :** i) **All questions are compulsory.**
ii) **Figures to the right indicate full marks.**
iii) **Draw neat labelled diagram wherever necessary.**
iv) **Use of log table or calculator is allowed.**

1. Select the correct alternative :

14

- i) Applied force per unit cross sectional area is called
a) Strain b) Stress c) Creep d) Ductility
- ii) The dielectric strength is function of
a) Thickness b) Length c) Charge d) None of these
- iii) Polymers are long chain organic micromolecule having _____ as a common element in their structure.
a) Sodium b) Nitrogen c) Chlorine d) Carbon
- iv) _____ polymers occurs naturally.
a) Nylon b) Starch c) PVC d) Teflon
- v) Ceramics naturally exhibit _____ nature.
a) soft b) hard c) brittle d) elastic
- vi) Combination of two or more materials is called _____ material.
a) Composite b) Metal c) Polymer d) Single phase
- vii) Ceramics are _____ materials.
a) Organic metallic b) Inorganic non-metallic
c) Inorganic metallic d) Organic non-metallic



- viii) The strength of composite is
a) Low b) High c) Zero d) Infinite
- ix) 1 nanometer
a) 10^{-23} m b) 10^{-12} m c) 10^{-9} m d) 10^{-19} m
- x) _____ prepared and explained carbon nanotube for first time.
a) Richard Feynmann b) Richard Smalley
c) Eric Drexler d) Sumia Iijima
- xi) _____ technique is used to determine the crystal structure of material.
a) SEM b) XRD c) FTIR d) UV-VIS
- xii) _____ materials have occupied an important role in bone repairing material in medical field.
a) Bioactive glasses and glass ceramics
b) Polymers
c) Composites
d) Nanomaterials
- xiii) The tanning operations on skin of animal produces
a) Leather b) Cloth c) Wool d) Blood
- xiv) Cermets are examples of
a) Micro composites b) Continuous fibre composite
c) Short fibre composite d) Large particle composite

2. Answer **any seven** of the following :

14

- i) Define specific heat.
- ii) Define the terms :
a) Hardness b) Fatigue
- iii) Define the polymerization mechanism.
- iv) Give any four examples of ceramics.
- v) What are composites ?
- vi) Give any four characteristics of composites.



- vii) Write applications of nanomaterials.
 - viii) What is biomechanism ?
3. A) Answer **any two** of the following : **10**
- i) Explain electrical properties of materials.
 - ii) Give any five applications of polymers.
 - iii) Write note on ceramic processing.
- B) Write note on chemical bath deposition method. **4**
4. Answer **any two** of the following : **14**
- i) Explain properties and applications of composite materials.
 - ii) Discuss various techniques of characterization of nanostructured materials.
 - iii) Explain classification of biomaterials.
5. Answer **any one** of the following : **14**
- i) Define thermoplastic and thermosetting polymers. Discuss various methods of Fabrication of polymers in details.
 - ii) Explain classification of materials in details. Give magnetic and optical properties of materials.
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B.Sc. (Part – III) (Semester – VI) (New CGPA) Examination, 2017

CHEMISTRY

Special Paper – XII : Inorganic Chemistry

Time : 2½ Hours

Total Marks : 70

- Instructions :** 1) *All questions are compulsory.*
2) *Figures to the right indicate full marks.*
3) *Draw neat labelled diagram whenever necessary.*

1. Select the correct alternative for the following and rewrite the sentence : **14**
- 1) Transuranic elements are also called as _____ elements.
a) man made b) lanthanide c) lanthanum d) p-block
 - 2) Actinons have _____ incomplete outermost shells.
a) three b) two c) four d) five
 - 3) In lanthanide series, the differentiating electrons are added in
a) 4f sub shell b) (n – 2) sub shell
c) 3f sub shell d) None of these
 - 4) $\text{YBa}_2\text{Cu}_3\text{O}_7$ is _____ superconductor.
a) 237 b) 123 c) 231 d) 321
 - 5) When pentavalent impurity is added to silicon crystal _____ type semiconductor is formed.
a) n – p b) neither n nor p
c) p d) n
 - 6) Crystal structures are
a) fcc b) bcc c) hcp d) all of these
 - 7) Inorganic benzene is
a) Diborane b) Xenondifluride c) Borazine d) None of these



- 8) The bond angle in SO_3 molecule is
a) 180° b) 109.5° c) 90° d) 120°
- 9) Diborane is _____ molecule.
a) Electron rich
b) Electron deficient
c) Neither electron rich nor electron deficient
d) None of these
- 10) Effect of oxygen on corrosion is explained by
a) Whitney principle b) Faraday's rule
c) Evan's rule d) Kier's principle
- 11) _____ is essential for corrosion.
a) Solid b) Liquid c) Gas d) Water
- 12) Self stifling _____ corrosion.
a) Prevents b) Promotes c) Decreases d) All of these
- 13) The compound containing at least one metal-carbon bond is
a) Coordinate compound b) Organometallic compound
c) Inorgano metallic compound d) Inorganic polymer
- 14) In mononuclear carbonyls _____ metal atom is linked with number of carbonyl groups.
a) one b) two c) more than one d) none of these

2. Answer **any seven** of the following :

14

- 1) Write the electronic configuration of Berkelium and Thorium.
- 2) What are the applications of superconductors ?
- 3) Mention any four properties of metallic solids.
- 4) Draw the structure of $\text{YBa}_2\text{Cu}_3\text{O}_7$.
- 5) Distinguish between Diborane and Ethane.
- 6) Draw the structure of phosphorus pentoxide.
- 7) Define atmospheric corrosion and immersed corrosion.
- 8) Write note on oxide film theory.
- 9) Define the terms :
 - a) Mononuclear carbonyl
 - b) Terminal carbonyl group.



3. A) Answer **any two** of the following : **10**
- 1) Explain the separation of lanthanides by ion exchange method.
 - 2) Explain the structure of XeO_4 .
 - 3) Discuss the structure of alkyl and aryl compounds of Lithium.
- B) Discuss electrochemical theory of corrosion. **4**
4. Answer **any two** of the following : **14**
- 1) Give the detail electronic configuration of lanthanides.
 - 2) Discuss the classification of solids as conductors, insulators and semiconductors on the basis of band theory.
 - 3) Explain the methods of protection of metals from corrosion.
5. Answer **any two** of the following : **14**
- 1) Explain IUPAC nomenclature of super heavy elements with atomic number greater than 100.
 - 2) What are semiconductors ? Explain extrinsic conductors in detail.
 - 3) Explain the structures of XeF_2 and XeF_6 with the help of hybridization of the orbitals and box diagrams.
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B.Sc. – III (Semester – VI) Examination, 2017
BOTANY (New) (CGPA)
Systematics of Angiosperms (Special Paper – XII)

Time : 2½ Hours

Total Marks : 70

- Instructions :** 1) **All** questions are **compulsory**.
2) Draw **neat** labeled diagrams **wherever** necessary.
3) Figures to the **right** indicate **full** marks.

1. Rewrite the following sentences by choosing the correct alternative. 14
- 1) Bennettitalean theory was proposed by _____.
a) Saporta and Marion b) Thomas
c) Stebbins d) Gaussen
 - 2) Engler and Prantel system of classification of angiosperms is _____.
a) Natural b) Artificial
c) Phylogenetic d) None of these
 - 3) Dumb-bell shaped stomata occurs in _____ type.
a) Dicotyledons b) Monocotyledons
c) Both a and b d) None of these
 - 4) _____ cells plays a role of nutrition.
a) Epidermis b) Endothecium
c) Tapatum d) Sporogenous tissue
 - 5) In Bisporic embryo sac, the egg apparatus is made up of _____ cells.
a) One b) Two c) Three d) Four
 - 6) The typical embryo sac is made up of _____ cells.
a) Three b) Five c) Seven d) Nine
 - 7) Coenomegaspores occurs in _____ embryo sac.
a) Monosporic b) Tetrasporic c) Bisporic d) None of these



- 8) In typical anther, there are _____ microsporangia.
a) One b) Two c) Three d) Four
- 9) The flowers pollinated by insects are called as _____.
a) Malcophelous b) Ornithophelous
c) Entemophelous d) Hydrophelous
- 10) _____ is the endospermic seed.
a) Jowar b) Castor
c) Groundnut d) None of these
- 11) The entry of pollen tube in ovule through integument, is known as _____.
a) Chalazogamy b) Mesogamy
c) Progamy d) None of these
- 12) Free nuclear divisions occurs in _____ type of endosperm.
a) Helobial b) Cellular c) Nuclear d) None of these
- 13) The fruit of Citrus is _____ type.
a) Hypanthodium b) Hesperidium
c) Berry d) Drup
- 14) *Citrus reticulata* belongs to family _____.
a) Ranunculaceae b) Myrtaceae
c) Rubiaceae d) Rutaceae

2. Answer **any seven** of the following :

14

- i) Mention the advanced characters of flower.
- ii) What is meant by archesporium ?
- iii) Describe nutritive role of tapatum.
- iv) Sketch and label the circinotropous ovule.
- v) Mention the economic importance of Cucurbitaceae.
- vi) What is meant by self sterility ?
- vii) Sketch and label dicotyledonous stomata.
- viii) Mention any endospermic seed.
- ix) Give the correct botanical name of Tulasi.



3. A) Answer **any two** of the following : 10
- i) Describe Gnetalean theory.
 - ii) Describe the nuclear endosperm development.
 - iii) Describe the role of cytology in relation with taxonomy.
- B) Give merits and demerits of Engler and Prantl's system of classification. 4
4. Answer **any two** of the following : 14
- i) Describe the process of double fertilization with its significance.
 - ii) Describe the bisporic embryo sac development with suitable example.
 - iii) Mention the economic important plants to Capparidaceae with uses.
5. Answer **any two** of the following : 14
- i) What is meant by microsporogenesis ? Add a note on development of male gametophyte.
 - ii) Describe the water dispersal mechanism in fruits.
 - iii) Give the distinguishing characters of any one of the following families and mention one plant of economic importance from it.
 - a) Myrtaceae b) Cannaceae.
-



- 6) Glucagon is secreted by _____
- a) α -Alpha Cell of Islets b) β -Beta Cell of Islets
c) γ -Gamma Cell of Islets d) ρ -Rho Cell of Islets
- 7) Number of sweat glands in skin of _____ Mammals much reduced to avoid water loss through surface.
- a) Aquatic b) Wet land
c) Glacier d) Desert
- 8) _____ Gland is both exocrine and endocrine gland.
- a) Pituitary b) Parathyroid
c) Thyroid d) Pancreas
- 9) The number of species in a specified area is called _____ diversity.
- a) Alfa b) Beta
c) Gama d) Deta
- 10) The most important reason for decrease in biodiversity is _____
- a) Introduction of exotic species b) Habitat pollution
c) Over evaporation d) Habitat destruction
- 11) Endemic species are _____
- a) Rare species
b) Species located in the specific region
c) Cosmopolitan in distribution
d) Critically endangered
- 12) _____ are the species that can be used to monitor health of an environment or ecosystem.
- a) Ectodegreder b) Biological indicators
c) Ecodestructor d) Bionatures
- 13) _____ is a heavy metal toxicant.
- a) DDT b) Malathion c) Endosulphan d) Cadmium
- 14) Parathormone regulates _____
- a) Increase in blood sugar level b) Decrease in serum calcium level
c) Increase in serum calcium level d) Decrease in blood sugar level



2. Answer **any seven** of the following : **14**
- i) Hypo thyroidism.
 - ii) Grass land habitat.
 - iii) Heavy metal toxicants.
 - iv) Biodiversity.
 - v) Osteoporosis.
 - vi) Adaptation in desert animals.
 - vii) Parathormone.
 - viii) TRH.
 - ix) Pesticide toxicants.
3. A) Answer **any two** of the following : **10**
- i) Functions of parathyroid hormone.
 - ii) Conservation of GIB.
 - iii) Applications of Toxicology.
- B) Rain water harvesting. **4**
4. Answer **any two** of the following : **14**
- i) Bio magnification.
 - ii) Functions of thyroid hormones.
 - iii) Solid waste management.
5. Answer **any two** of the following : **14**
- i) Describe the characteristics and faunal adaptation of marine water habitat.
 - ii) Write detail account on histological structure and functions of hormones of Adrenal gland.
 - iii) Discuss the functions and disorders of hormones of Islets of Langarhans.
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B.Sc. – III (Semester – VI) (New – CGPA) Examination, 2017
MATHEMATICS (Special Paper No. – XII)
Numerical Analysis

Time : 2½ Hours

Max. Marks : 70

- Instructions:** 1) Use of scientific calculator are **allowed**.
2) **All** questions are **compulsory**.
3) Figure to the **right** indicates **full** marks.

1. Choose the correct alternative :

14

1) If $\Delta \nabla =$

- a) $\nabla \Delta$ b) $\nabla + \Delta$ c) $\nabla - \Delta$ d) None of these

2) If the interval of differencing of unity, then $\Delta^4 [(1-x)(1-2x)(1-3x)] =$

- a) 1 b) 2 c) 3 d) 0

3) Given $x = 1 \ 2 \ 3$ then $\Delta^2 f(1) =$

$$f(x) = 3 \ 8 \ 15$$

- a) 3 b) 4 c) 2 d) 1

4) The value of $\Delta^n (e^x) =$ _____ the interval of differencing being 1.

- a) $(e + 1)^n e^x$ b) $(e - 1)^n e^x$ c) e^x d) ne^x

5) If $y = x^2 - 2x + 2$ taking interval differencing as unity $\Delta^2 y =$

- a) 2 b) 3 c) 1 d) 0

6) Interpolation is the technique of estimate the value of a function for any

- a) Intermediate value of the constant
b) Intermediate value of the variable
c) Both (a) and (b)
d) None of these



- 7) If $y(1) = 4$, $y(3) = 12$, $y(4) = 19$, find $y(x) = 7$, find x using Lagrange's formula
 a) 1.857 b) 1.758 c) 1.578 d) 1.587
- 8) The exact value of $\int_0^6 \frac{dx}{1+x^2} =$
 a) 1.2056 b) 1.4506 c) 1.5406 d) 1.6540
- 9) Simson's $\left(\frac{3}{8}\right)^{\text{th}}$ rule is obtained by $n =$ _____ in general quadrature formula.
 a) 1 b) 2 c) 3 d) None of these
- 10) To find value of 2nd order derivative at the tabulated point the value of p is
 a) 1 b) 2 c) 0 d) None of these
- 11) The expansion for $\left(\frac{dy}{dx}\right)_{x=x_0}$ using backward difference is
 a) $\left(\frac{dy}{dx}\right)_{x_n} = \frac{1}{n} \left(\nabla y_n + \frac{1}{2} \nabla^2 y_n + \frac{1}{3} \nabla^3 y_n + \dots \right)$
 b) $\left(\frac{dy}{dx}\right)_{x_n} = \frac{1}{n} \left(\nabla y_n - \frac{1}{2} \nabla^2 y_n + \frac{1}{3} \nabla^3 y_n + \dots \right)$
 c) $\left(\frac{dy}{dx}\right)_{x_n} = n \left(\nabla y_n + \frac{1}{2} \nabla^2 y_n + \frac{1}{3} \nabla^3 y_n + \dots \right)$
 d) $\left(\frac{dy}{dx}\right)_{x_n} = n \left(\nabla y_n - \frac{1}{2} \nabla^2 y_n + \frac{1}{3} \nabla^3 y_n - \dots \right)$
- 12) If $\lambda_1, \lambda_1, \lambda_1$ are real an equal roots then C.F. =
 a) $c_1(\lambda_1)^n + c_2(\lambda_1)^n + c_3(\lambda_1)^n$ b) $(c_1 + c_2n + c_3n^2) (\lambda_1)^n$
 c) $(c_1 - c_2n - c_3n^2)(\lambda_1)^n$ d) None of these



- 13) If $(E - 1)(E + 2)(E - 3) = 0$ then $u_n =$
- a) $u_n = c_1(1)^n + c_2(-2)^n + c_3(3)^n$ b) $u_n = c_1(-1)^n + c_2(2)^n + c_3(-3)^n$
 c) $u_n = c_1(-1)^n + c_2(-2)^n + c_3(-3)^n$ d) None of these
- 14) The particular integral of $(E^2 - 4E + 3)y_n = 5^n$ is
- a) P.I = $\frac{1}{8}5^n$ b) P.I = $\frac{8}{5^n}$ c) $\frac{1}{5}8^n$ d) $\frac{5}{8^n}$

2. Attempt **any seven** of the following :

14

- 1) Evaluate $\Delta^2 \cos 2x$.
- 2) With usual notation prove that $\mu = \frac{1}{2} \left(E^{1/2} + E^{-1/2} \right)$.
- 3) Prove that $e^x = \left(\frac{\Delta^2}{E} \right) e^x \cdot \frac{Ee^x}{\Delta^2 e^x}$, the interval of differencing being h .
- 4) State Newton's backward interpolation formula.
- 5) State Lagrange's interpolation formula for unequal interval.
- 6) Solve $y_{n+1} - 2y_n \cos \alpha + y_{n-1} = 0$.
- 7) Solve $y_{n+2} - 5y_{n+1} + 6y_n = 4^n$.
- 8) State Trapezoidal rule.
- 9) State Newton's-cotes quadrature formula.

3. A) Attempt **any two** of the following :

10

- 1) Prove that $\mu = \frac{2 + \Delta}{2\sqrt{1 + \Delta}} = \sqrt{1 + \frac{1}{4}\delta^2}$.
- 2) Find the polynomial $f(x)$ by using Lagrange's formula and hence find $f(4)$
 $x: \quad 0 \quad 1 \quad 2 \quad 5$
 $f(x): 2 \quad 3 \quad 12 \quad 147$
- 3) Evaluate $\int_0^1 \frac{x^2}{1+x^3} dx$ using Simpson's $\left(\frac{1}{3}\right)^{\text{rd}}$ rule.

B) Solve $y_{x+1}^2 - 3y_{x+1}y_x + 2y_x^2 = 0$.

4



4. Attempt **any two** of the following :

14

1) Solve $y_{x+2} - 4y_{x+1} + 4y_x = 3 \cdot 2^x + 5 \cdot 4^x$.

2) If x : 1.0 1.1 1.2 1.3 1.4 1.5 1.6

$f(x)$: 7.989 8.403 8.781 9.129 9.451 9.750 10.031

Find $\frac{dy}{dx}$ and $\frac{d^2y}{dx^2}$ at $x = 1.1$ and $x = 1.6$.

3) Using Newton's backward difference formula, construct an interpolating polynomial of degree three for the data.

$f(-0.75) = -0.718125$, $f(-0.5) = -0.02475$, $f(-0.25) = 0.3349375$, $f(0) = 1.10100$.

Hence find $f\left(-\frac{1}{3}\right)$.

5. Attempt **any two** of the following :

14

1) State and prove Simson's $\left(\frac{1}{3}\right)^{\text{rd}}$ rule.

2) State and prove Newton's forward interpolation formula.

3) Prove that with usual notation

a) $\left(E^{1/2} + E^{-1/2}\right)(1 + \Delta)^{1/2} = 2 + \Delta$.

b) $\nabla y_{n+1} = n \left(1 + \frac{1}{2} \nabla + \frac{5}{12} \nabla^2 + \dots\right) y_n^1$.



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B.Sc. III (Semester – VI) (New) (CGPA Pattern) Examination, 2017
STATISTICS
Design of Experiments (Special Paper – XII)

Time : 2½ Hours

Max. Marks : 70

- N.B. :** i) **All questions are compulsory.**
ii) **Use of simple or scientific calculator is allowed.**
iii) **Figures to the right indicate full marks.**
iv) **Graph papers will be supplied if required.**

1. Select most correct alternative.

14

- i) An experimental unit in DOE is
a) an animal
b) a field plot
c) a group of insects
d) all of these
- ii) RBD has
a) two-way classification
b) one-way classification
c) three-way classification
d) no classification
- iii) Local control in DOE is to
a) reduce experimental error
b) form homogeneous blocks
c) increase efficiency of design
d) all of these
- iv) CRD is
a) restricted design
b) non-restricted design
c) unsystematic design
d) none of these
- v) Missing value in an experiment is estimated by
a) ANCOVA
b) minimising the error mean square
c) both a) and b)
d) none of these
- vi) If different effects are confounded in different blocks then it is said to be
a) complete confounding
b) balanced confounding
c) partial confounding
d) none of these

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- vii) RBD is more efficient than CRD unless.
- a) block variation is zero b) block variation is greater than zero
c) block variation is less than zero d) none of these
- viii) A split plot design can involve only
- a) two factors b) three factors c) one factor d) none of these
- ix) In RBD with 4 blocks and 3 treatments, the error degrees of freedom are
- a) 12 b) 6 c) 9 d) 11
- x) The experiments which involve more than one factor are called
- a) simple experiments b) balanced experiments
c) factorial experiments d) none of these
- xi) In LSD, the number of rows, columns and treatments are
- a) all different b) always equal
c) not necessarily equal d) none of these
- xii) Randomization is a process in which the treatments are allocated to all experimental units.
- a) with equal probability b) at the will of an investigator
c) in a sequence d) none of these
- xiii) Error sum of squares in RBD as compared to CRD using same material is
- a) more b) less c) equal d) none of these
- xiv) Missing observation in a CRD is to be
- a) guessed b) estimated c) deleted d) none of these

2. Answer **any seven** of the following.

14

- i) What is confounding ?
- ii) Describe missing plot technique.
- iii) Explain the principle of replication.
- iv) Define an efficiency of a design.
- v) Explain the terms treatment and yield in DOE.
- vi) Describe RBD.
- vii) Explain ANOVA technique.
- viii) Describe Split Plot Design (SPD).
- ix) Describe factorial experiments.



3. A) Answer **any two** of the following. **10**
- i) Define main and interaction effects in 2^2 -factorial experiment.
 - ii) Explain the principle of randomization and local control in DOE.
 - iii) Describe LSD and give its layout for 4×4 LSD.
- B) What is CRD ? Give its ANOVA table. **4**
4. Answer **any two** of the following. **14**
- i) Obtain the formula for estimating one missing observation in LSD.
 - ii) Explain the ANOVA technique for one-way classification.
 - iii) Explain total confounding with respect to 2^3 -factorial experiment.
5. Answer **any two** of the following. **14**
- i) Obtain the formula for estimating efficiency of LSD over RBD when rows are taken as blocks. Give the formula when columns are taken as blocks.
 - ii) Give mathematical model, assumptions and ANOVA table in case of RBD.
 - iii) Give mathematical model, null hypothesis and ANOVA table for a 2^2 -factorial experiment arranged in RBD.
-



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**B.Sc. – III (Semester – VI) Examination, 2017
(New CGPA)
GEOLOGY (Special Paper – XII)
Pre-Cambrian Stratigraphy of India**

Time : 2½ Hours

Max. Marks : 70

- Instructions :** 1) *All questions are compulsory.*
2) *Figures to the right indicate full marks.*
3) *Draw neat labelled diagrams wherever necessary.*

1. Fill in the blanks with correct answer from given options. **14**
- 1) Which one of the following series of Vindhyan System show occurrences of life ?
a) Bhandar b) Rewah c) Kaimur d) None of these
 - 2) Diamondiferous sandstone beds occurring at the base of Kurnool series is known as _____ beds.
a) Malani b) Palnad c) Banaganapalli d) Pakhal
 - 3) Bhima series is a part of _____ Vindhyan.
a) upper b) middle c) lower d) none of these
 - 4) Eparchaeon unconformity is present between _____ and _____.
a) Archaean; Aravalli b) Archaean; Dharwar
c) Archaean; Cuddapah d) Archaean; Vindhyan
 - 5) Which formation of Saucer group is more important for manganese ore _____
a) Sitasong formation b) Lohangi formation
c) Mansar formation d) Chorbaoli formation
 - 6) Iron ore series is equivalent to _____
a) Peninsular gneiss b) Upper Dharwar
c) Middle Dharwar d) Lower Dharwar

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- 7) The oldest rocks forming the foundation rocks over which all the other rock systems have been deposited are known as _____ complex.
- a) Basement b) Fundamental c) Archaean d) All of these
- 8) Famous 'Makrana marble' belongs to _____
- a) Delhi system b) Bundelkhand gneiss
c) Aravalli system d) Raialo series
- 9) Dharwarian rocks of manganese deposits occurs in Nagpur, Chhindwara and Bhandara district have been named as _____
- a) Iron-ore b) Saucer c) Chilpi d) None of these
- 10) Which one of the following series forms in the upper Cuddapah System ?
- a) Papaghani b) Cheyair c) Kistna d) Kurnool
- 11) Aravalli System is overlain by _____
- a) Bundelkhand gneiss b) Raialo series
c) Bangol gneiss d) Charnokite series
- 12) The most common rocks in Archaean System are _____.
- a) marbles b) slates
c) sandstone d) gneisses and schists
- 13) The Kurnool Series is _____
- a) of carboniferous age and is located in Karaal district of Haryana
b) of Lower Vindhyan age and occurs in Andhra Pradesh
c) of Cuddapah age and occurs in Mysore
d) none of the above
- 14) Which one of the following sentences is true for the Cuddapah System ?
- a) It is unfossiliferous
b) It is composed of high grade schists and gneisses
c) It is highly tectonically disturbed
d) It is underlain by Dharwar system



2. Answer **any seven** of the following : **14**
- i) What are another names given to the Archaean rocks ?
 - ii) What are the major rock types found in Archaean System ?
 - iii) Names of rock types exposed in Charnokite series of Archaean System.
 - iv) Name of rock type exposed in Bundelkhand gneiss of Archaean System.
 - v) What is peninsular gneiss ?
 - vi) What are types of rocks found in Dharwar System ?
 - vii) What is the name of Dharwarian rocks of the Aravalli region ?
 - viii) What are Champion gneisses ?
 - ix) Write stratigraphic succession of Charnokite, Champion and Peninsular gneisses.
3. A) Write short notes on **any two** of the following : **10**
- i) Bundelkhand gneisses
 - ii) Fundamental gneisses
 - iii) Raialo Series.
- B) Describe economic importance of Aravallis of Rajasthan. **4**
4. Answer **any two** of the following : **14**
- i) Describe in brief, stratigraphic sequence and lithology of Kaimur series.
 - ii) Describe in brief, stratigraphic sequence and lithology of Lower Cuddapah System.
 - iii) Describe in brief, stratigraphic sequence and lithology of Upper Vindhyan System.
5. Answer **any two** of the following : **14**
- i) Describe in brief, stratigraphic sequence and lithology of Upper Cuddapah System.
 - ii) Describe in detail economic importance of Dharwar System.
 - iii) Describe in brief, stratigraphic sequence, lithology of Kurnool System.
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B.Sc. III (Semester – VI) (New CGPA) Examination, 2017
MICROBIOLOGY (Special Paper – XII)
Microbial Biochemistry

Time : 2½ Hours

Max. Marks : 70

Instructions : 1) **All questions are compulsory.**
2) **Figures to the right indicate full marks.**
3) **Draw neat labelled diagram wherever required.**

1. Choose the correct answers from given alternatives : **14**
- 1) GOGAT play role in assimilation of nitrogen when intracellular concentration of _____ is less.
a) NO₃ b) NO₂ c) NH₃ d) N₂
 - 2) When $V_0 = \frac{1}{2} V_{max}$, then $k_m =$ _____
a) [S] b) [E] c) [ES] d) [P]
 - 3) Lux gene is responsible for _____ property of bacteria.
a) N₂ fixation b) NH₃ assimilation
c) Luminescence d) Translation
 - 4) _____ is used in immobilization.
a) Sodium chloride b) Sodium carbonate
c) Sodium citrate d) Sodium alginate
 - 5) Induced fit hypothesis is related with
a) Activity b) Flexibility c) Rigidity d) Rancidity
 - 6) Movement of ribosome on mRNA by one codon at a time is called _____
a) Transformation b) Transduction
c) Translocation d) Transcription



- 7) _____ is initiation codon.
a) UAG b) UGA c) UAA d) AUG
- 8) Carboxysomes contain _____ enzyme.
a) Ribose phosphate carboxylase
b) Ribose 1, 5 diphosphate carboxylase
c) Ribulose phosphate carboxylase
d) Ribulose 1, 5 diphosphate carboxylase
- 9) Bioluminescent organisms are generally found in
a) Hot springs b) Marine water c) Fresh water d) Soil
- 10) Isocitrate lyase and malate synthase enzymes are present in
a) Glyoxysomes b) Mesosomes
c) Ribosomes d) Carboxysomes
- 11) _____ play role in catabolite repression.
a) ATP b) AMP c) C-AMP d) ADP
- 12) _____ lipid is required in β -1, 4 linkage formation between N-acetylglucosamine and N-acetylmuramic acid.
a) C₁₇ b) C₅₄ c) C₃₈ d) C₅₅
- 13) Aspartate transcarbamoylase is activated by _____
a) ATP b) CTP c) UTP d) AMP
- 14) _____ acid contain pyridine nucleus and is the key intermediate in pyrimidine synthesis.
a) Inosinic b) Acetic c) Citric d) Orotic

2. Write on **any seven** of the following :

14

- 1) GOGAT.
- 2) Lux gene.
- 3) Isoenzyme.
- 4) Termination codons.
- 5) Glyoxysomes.
- 6) Initiation factors.
- 7) Translation.
- 8) Nucleotide.
- 9) List nitrogen bases.



3. A) Explain **any two** of the following : **10**
- 1) Regulation of allosteric enzymes.
 - 2) Pyruvate as key metabolite.
 - 3) Termination of protein synthesis.
- B) Significance of immobilization. **4**
4. Attempt **any two** of the following : **14**
- 1) Arabinose operon.
 - 2) Assimilation of SO_4 .
 - 3) PK pathway.
5. Attempt **any two** of the following : **14**
- 1) Biosynthesis of peptidoglycan.
 - 2) Extraction of enzymes.
 - 3) Assimilation of carbon.
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B.Sc. III (Semester – VI) (New CGPA) Examination, 2017
ELECTRONICS
Advanced Communication (Special Paper – XII)

Time : 2½ Hours

Max. Marks : 70

- N.B. :** 1) *All questions are compulsory.*
2) *Figures to **right** indicate **full** marks.*
3) *Draw neat diagrams **wherever** necessary.*
4) *Use of calculator is **allowed**.*

1. Select the correct alternative :

14

- 1) Fiber optic communication is based on the principle of
 - a) reflection
 - b) refraction
 - c) total internal reflection
 - d) none
- 2) The main function of a communication satellite is as a
 - a) repeater
 - b) reflector
 - c) recorder
 - d) none
- 3) In mobile communication each cell is connected to
 - a) control unit
 - b) MTSO
 - c) transmitter
 - d) none
- 4) _____ is a microwave device.
 - a) PN junction diode
 - b) Zener diode
 - c) Gunn diode
 - d) None
- 5) For high speed data transmission the bandwidth of communication channel must be
 - a) zero
 - b) low
 - c) high
 - d) none
- 6) _____ is the best source of light for fiber optic communication.
 - a) Bulb
 - b) LED
 - c) ILD
 - d) All of these
- 7) The most communication satellites operates in _____ bands.
 - a) L
 - b) C and Ku
 - c) X
 - d) S and P

P.T.O.



- 8) Cellular telephones use _____ type of operation.
a) simplex b) half duplex c) full duplex d) triplex
- 9) Radar is an acronym for
a) radio detection and ranging
b) radio amplification detection and ranging
c) range detection
d) none
- 10) The most widely used data communication code is
a) Baudot b) Morse Code c) ASCII Code d) None
- 11) _____ fiber optic cable has minimum modal dispersion.
a) Single mode step index b) Multimode step index
c) Multimode graded index d) None
- 12) The satellite whose time period is 24 hours is known as
a) geostationary satellite b) geosynchronous satellite
c) both a and b d) none
- 13) Wave guide is a
a) transmission line b) hollow metal tube
c) hollow tube of bad conductor d) none
- 14) _____ is the most widely used LAN configuration.
a) Star b) Ring c) Bus d) None

2. Attempt **any seven** of the following :

14

- 1) What is modal dispersion ?
- 2) Draw the block diagram of transponder.
- 3) What is velocity modulation ?
- 4) Define bit rate and baud rate.
- 5) Give the advantages of optical communication.
- 6) What is modem ? Give its function.
- 7) Draw the block diagram of mobile hand set.
- 8) Give the applications of radar.
- 9) What is protocol ? Give the protocol used in asynchronous data communication.



3. A) Attempt **any two** of the following : **10**
- 1) Explain the working of LASER diode.
 - 2) Discuss the applications of satellite communication.
 - 3) Write a note on cavity resonator.
- B) Draw the general block diagram of cellular phone and explain in brief. **4**
4. Attempt **any two** of the following : **14**
- 1) Explain optical transmitter circuits using LED.
 - 2) Draw the block diagram of earth station and explain in brief.
 - 3) Give the operational procedure of mobile communication.
5. Attempt **any two** of the following : **14**
- 1) Explain the working of pulsed radar.
 - 2) What is LAN, MAN and WAN ? Explain in brief.
 - 3) What are different network topologies ? Explain star topology.
-

**B) True or false :** **4**

- 1) executeBatch() method is used to execute queries that may return boolean Result.
- 2) A JComboBox component displays choices.
- 3) Cookies is implicit JSP object.
- 4) DSN related with type-3 JDBC driver.

C) Fill in the blanks : **4**

- 1) _____ is a small piece of information that is persisted between the multiple request.
- 2) _____ JSP Action tag is forwards the request and response to another resource.
- 3) _____ package contain the JDBC classes and interfaces.
- 4) The _____ JSTL core tag catches any exceptions that occurs in a program body.

2. Answer any seven of the following : **14**

- 1) What is Statement ?
- 2) What is EJB ?
- 3) List out JTextField methods.
- 4) List out advantages of JSP over servlet.
- 5) Define methods of servlet life cycle.
- 6) What is session ?
- 7) Difference between AWT and Swing.
- 8) List out advantages of JSTL.
- 9) Describe PreparedStatement.



3. A) Answer **any two** of the following : **10**
- 1) Explain JSP life cycle with suitable example.
 - 2) Differentiate between GenericServlet and HttpServlet.
 - 3) Write a program to demonstrate use of 'ServletContext' Interface.
- B) Explain different types of JSP tag elements. **4**
4. Answer **any two** of the following : **14**
- 1) Write a program to demonstrate that use of 'CallableStatement'.
 - 2) Explain types of JSTL Formatting tags.
 - 3) What is cookies ? Explain advantages and disadvantages of cookies.
5. Answer **any two** of the following : **14**
- 1) Write a program to check given String is palindrome or not using swing components.
 - 2) Explain different types of JDBC drivers.
 - 3) Explain any five Swing components.
-

Seat
No.

B.Sc. – III (Semester – VI) (New CGPA) Examination, 2017
PHYSICS (Special Paper – XIII)
Atomic, Molecular Physics and Quantum Mechanics

Time : 2½ Hours

Max. Marks : 70

- Instructions :** 1) **All questions are compulsory.**
2) **Figures to the right indicate full marks.**
3) **Use of log table and calculator is allowed.**
4) **Neat diagram must be drawn whenever necessary.**

1. Choose and write a correct answer from given four alternatives : **14**

- i) m_j can have only _____ values from $-j$ to $+j$, excluding zero.
a) $j(j+1)$ b) $2j+1$ c) $\sqrt{j(j+1)}$ d) $\sqrt{(2j+1)}$
- ii) In strong field Stark effect for $n=2$, the degeneracy in fine structure is lifted to _____ levels.
a) 1 b) 2 c) 3 d) 4
- iii) Electronic spectra of diatomic molecules occurs in _____ region.
a) uv-vis b) microwave c) infra-red d) X-ray
- iv) Quantity $\psi\psi^*$ is called
a) Probability density b) Probability current density
c) Reflection co-efficient d) Transmission co-efficient
- v) The minimum energy of a particle confined to one dimensional rigid box is obtained by substituting n equal to
a) zero b) one c) half d) two
- vi) Momentum operator is given by
a) $\frac{\hbar}{i} \frac{d^2}{dx^2}$ b) $\frac{\hbar}{i} \frac{d}{dx}$ c) $i\hbar \frac{d}{dx}$ d) $-i\hbar \frac{d}{dt}$
- vii) The $np - 2s$ transitions of principal series $n \geq 2$ correspond to _____ series of Li.
a) Diffuse b) Fundamental c) Sharp d) Principal

P.T.O.



- viii) The ratio of magnetic moment to the mechanical moment of orbital motion of electron is
- a) $\frac{e}{2m}$ b) $2\frac{e}{2m}$ c) $2\frac{e}{m}$ d) $\frac{e}{m}$
- ix) The selection rule $\Delta V = \pm 1$ and $\Delta J = -1$ in vibrational – rotational spectra corresponds to _____ branch.
- a) O b) P c) Q d) R
- x) A moving particle of matter is always associated with
- a) Wave b) Photon c) Radiation d) Charge
- xi) For a free particle the potential energy $V(r) =$
- a) -1 b) 0 c) $+1$ d) $+2$
- xii) Most intense line in a doublet corresponds to
- a) Maximum j value
 b) j and l change in the same way
 c) both conditions a) and b) together
 d) j and l do not change in the same way
- xiii) If the coupling between l^* and s^* is not broken in an external magnetic field, then we observe
- a) Normal Zeeman effect b) Paschen-Back effect
 c) Stark effect d) Anomalous Zeeman effect
- xiv) If $\sin 4x$ is eigen function and $\frac{d^2}{dx^2}$ is operator then eigen value of operator is
- a) -16 b) $+16$ c) -4 d) 4

2. Answer **any seven** of the following :

14

- i) Give intensity rules for qualitative analysis. Illustrate with an examples.
- ii) Draw necessary energy level diagrams for Zeeman splitting of sodium D line.
- iii) What are stokes and antistokes lines ?
- iv) Find eigen value of eigen functions e^{-2ix} of operator $\frac{d^2}{dx^2}$.
- v) What is tunnel effect ?
- vi) Show that $[x^n, Px] = n x^{n-1} i\hbar$.
- vii) Give the electronic configuration of K (potassium).
- viii) What is an operator ?



3. A) Answer **any two** of the following : **10**
- i) Discuss quantitative intensity rules used to calculate relative intensity of spectral lines in doublet. Give simple examples.
 - ii) Write a note on frank condon principle.
 - iii) Write a note on zero point energy.
- B) Prove that $[L^2, L_x] = [L^2, L_y] = [L^2, L_z] = 0$. **4**
4. Solve **any two** of the following : **14**
- i) What is Paschen back effect ? Obtain an expression for term value.
 - ii) Derive Schrodinger's time dependent wave equation for matter wave in three dimensions.
 - iii) Obtain eigen value of operator L^2 .
5. Solve **any one** of the following : **14**
- i) Obtain an expression for rotational energy of a diatomic molecule and explain its spectrum with energy level diagram.
In CO, the $j = 0 \rightarrow j = 1$ absorption line in rotational spectra occurs at a frequency 1.153×10^{11} Hz. Calculate the moment of inertia of molecule and bond length.
[Given : Mass of $^{12}\text{C} = 1.99 \times 10^{-26}$ kg and Mass of $^{16}\text{O} = 2.66 \times 10^{-26}$ kg].
 - ii) Apply Schrodinger's wave equation to a particle in one dimensional rigid box, give the energy levels.
Calculate ground state energy of a particle of mass 10 gm which is free to move between two ends separated by 10×10^{-8} cm.
Given Plank's constant $h = 6.6 \times 10^{-27}$ erg sec.
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B.Sc. (Part – III) (Semester – VI) (New-CGPA) Examination, 2017
CHEMISTRY
Organic Chemistry (Special Paper – XIII)

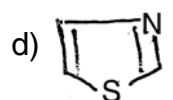
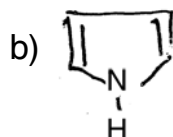
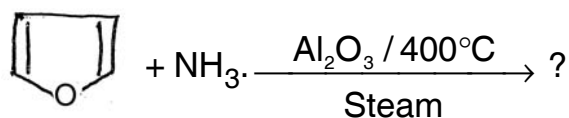
Time : 2½ Hours

Max. Marks : 70

- N. B. :** 1) **All questions are compulsory.**
2) Figures to **right** indicates **full** marks.
3) **Draw** neat labelled diagram and give equations **wherever** necessary.

1. Choose the most correct alternative for **each** of the followings : **14**

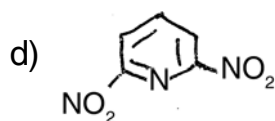
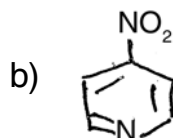
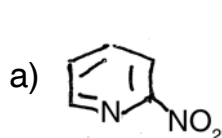
i) Predict the product of the following reaction :



ii) The carbohydrates which do not undergo further hydrolysis are known as

- a) Monosaccharides b) Oligosaccharides
c) Polysaccharides d) None of these

iii) Pyridine on nitration with $\text{KNO}_3/\text{H}_2\text{SO}_4$ at 300°C gives.

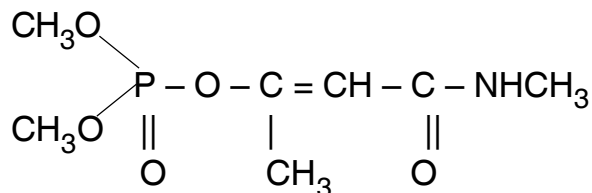




- iv) Maltose on hydrolysis gives a mixture of
- | | |
|------------------------|------------------------|
| a) Glucose + Fructose | b) Fructose + Fructose |
| c) Glucose + Galactose | d) Glucose + Glucose |
- v) Adrenaline on fusion with KOH gives
- | | |
|------------------|------------------------|
| a) Benzoic acid | b) Protocatechuic acid |
| c) Veratric acid | d) Phenylacetic acid |
- vi) The abnormal elongation of thyroid gland leads to disease
- | | |
|---------------|--------------|
| a) Goitre | b) Myxoedema |
| c) Xerthalmia | d) Cretinism |
- vii) GD(+) Glucose on acetylation with acetic anhydride forms _____
- | | |
|---------------------------|---------------------------|
| a) Diacetyl derivative | b) Triacetyl derivative |
| c) Tetraacetyl derivative | d) Pentaacetyl derivative |
- viii) Which of the following is antidiabetic drug ?
- | | |
|-------------------|----------------|
| a) Ethambutol | b) Tolbutamide |
| c) Phenobarbitone | d) Isoniazid |
- ix) Name the following drug
- $$\begin{array}{c}
 \text{CH}_3 \\
 \diagdown \\
 \text{CH} - \text{CH}_2 - \text{C}_6\text{H}_4 - \text{CH} - \text{COOH} \\
 \diagup \\
 \text{CH}_3
 \end{array}$$
- The chemical structure shows a benzene ring with a methyl group and a propionic acid chain (CH(CH₃)-CH₂-COOH) attached at the para position.
- | | |
|----------------|------------------|
| a) Paracetamol | b) Chloromycetin |
| c) Paludrin | d) Ibuprofen |
- x) Synthetic fibers are dyed with
- | | |
|----------------|----------------|
| a) Dispers dye | b) Sulphur dye |
| c) Mordent dye | d) Indigo dye |
- xi) Orange IV dye is synthesised by coupling of sulphanilic with
- | | |
|------------------|------------------|
| a) Diethylamine | b) Diphenylamine |
| c) Dimethylamine | d) Aniline |
- xii) Methoxychlor is prepared by condensation of chloral with two molecules of
- | | |
|------------|-----------------------|
| a) Phenol | b) α -naphthol |
| c) Benzene | d) Anisole |



xiii) Name the following pesticide



- a) Monocrotophos
- b) Carbaryl
- c) Ethophan
- d) Parathion

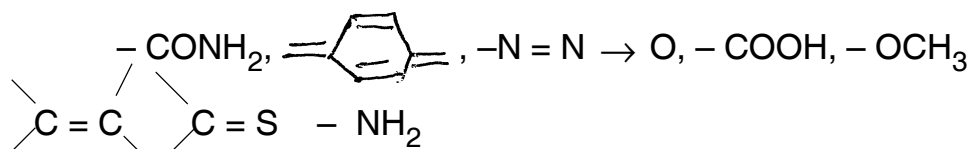
xiv) Weerman's reaction is used for

- a) Chain lengthening of carbohydrate
- b) Conversion of glucose to fructose
- c) Chain shortening of carbohydrate
- d) Conversion of fructose to glucose

2. Answer **any seven** of the followings :

14

- i) Explain why pyrrole is weak base.
- ii) Give any two methods of preparations of pyridine.
- iii) Give structure and uses of lactose.
- iv) Explain mutarotation with mechanism.
- v) Give brief classification of Hormones.
- vi) Why phenolphthalein has pink colour in alkaline medium ? Explain with reaction.
- vii) Give synthesis of carbaryl.
- viii) Classify the following groups in chromophores and auxochromes :



ix) Give structures of methyl red and disperse red-G.

3. A) Answer **any two** of the following :

10

- i) Discuss Skraup's synthesis quinoline.
- ii) Give synthesis of thyroxine.
- iii) What are antibiotics ? Give synthesis of chloromycetin.

B) Give synthesis and uses of Indole-3-acetic acid.

4

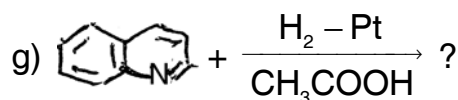
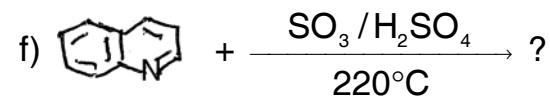
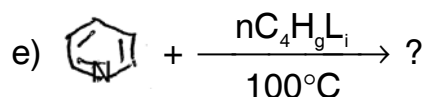
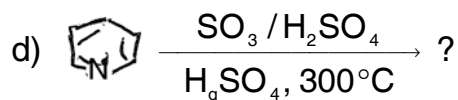
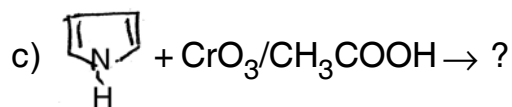
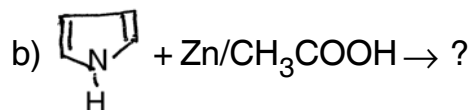
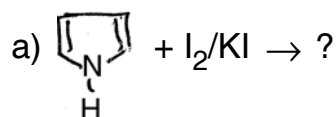


4. Answer **any two** of the following : 14

- i) Discuss the configuration of D-glucose from D-arabinose.
- ii) Discuss the structure of vitamin-A on the basis of analytical ground.
- iii) What are antimalarials ? Give synthesis of paludrin.

5. Answer **any two** of the following : 14

- i) Explain the size of ring structure of D-Glucose by methylation method.
- ii) Discuss the applications of Mordant and Vat dyes.
- iii) Predict the product following reactions :





- 8) Mutations can be induced experimentally with the help of various physical and chemical agents which are called
- a) Spontaneous mutation b) Mutant
c) Mutagenes d) Polyploidy
- 9) Somatic chromosome number in *Saccharam officinarum* is $2n =$
- a) 60 b) 70 c) 80 d) 90
- 10) Two cotton varieties 170-Co2 and 134-Co2M were developed by
- a) Test cross b) Back cross c) Double cross d) Triple cross
- 11) Median for arranged data is
- a) Mean of first and last value b) Most frequent value
c) Last frequent value d) Middle most value
- 12) With the help of histogram we can determine
- a) Mean, mode and median b) Mean
c) Median d) Mode
- 13) Clonal selection is practiced in _____ crops.
- a) Self pollinated b) Cross pollinated
c) Vegetatively propagated d) None of all
- 14) In transformation, non-virulent strain is
- a) P-type b) Q-type c) R-type d) S-type

2. Solve **any seven** of the following :

14

- 1) Write the merits of mode.
- 2) What is mutation ?
- 3) Give the names of DNA viruses.
- 4) Define conjugation.
- 5) Write any four disease resistant variety of cotton.
- 6) Give any two objectives of sugarcane breeding.
- 7) Enlist the methods of data analysis.
- 8) Draw neat labeled diagram of bacterial genome.
- 9) Define mass selection.



3. A) Write notes on **any two** of the following : 10
- 1) What is introduction ? Describe in brief types of introduction.
 - 2) Write a note on pure line selection.
 - 3) Explain the process of transduction in bacteria.
- B) Write the applications of computer in plant sciences. 4
4. Attempt **any two** of the following : 14
- 1) Explain the role of mutation in plant breeding.
 - 2) What is meant by arithmetic mean ? Explain it with suitable example and add note on its merits.
 - 3) Write the breeding techniques in cotton.
5. Attempt **any two** of the following : 14
- 1) What is mean by hybridization ? Explain the steps involved in hybridization.
 - 2) Give an account of DNA viruses studied by you.
 - 3) Explain the breeding technique in self pollinated crop.
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SLR-C – 247

Seat No.	
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B.Sc. (Part – III) (Semester – VI) (New CGPA Pattern) Examination, 2017
ZOOLOGY (Special Paper – XIII)
Molecular Biology and Biotechnology

Time : 2½ Hours

Total Marks : 70

- Instructions :** 1) **All questions are compulsory.**
2) **Figures to the right indicate full marks.**
3) **Draw neat labeled diagrams wherever necessary.**

1. Select the appropriate answer from **each** of the following and rewrite the sentence :

14

- 1) On heavy DNA damage, *E. coli* stops to grow and induces DNA repair system known as
- a) Base-excision repair b) Nucleotide excision repair
c) Photoreactivation d) SOS System
- 2) Replication of DNA occurs by _____ method.
- a) Conservative b) Dispersive
c) Semi-conservative d) Semi-dispersive
- 3) Removal of introns and joining of exons is known as
- a) Excision b) Recombination
c) Priming d) Splicing
- 4) Hershey and Chase performed their experiment using
- a) Frog and Lizard b) T2 bacteriophage and Bacteria
c) Monkey and Chimpanzee d) Rat and Rabbit
- 5) Formation of Hairpin loop is necessary transcription
- a) Initiation b) Elongation
c) Termination d) Post-transcriptional modifications

P.T.O.



- 6) _____ enzyme is responsible for the process of transcription.
- a) RNA dependent RNA Polymerase
 - b) DNA dependent DNA Polymerase
 - c) DNA dependent RNA Polymerase
 - d) None of the above
- 7) The property of genetic code that a single amino-acid coded by more than one codon is known as
- a) Termination
 - b) Splicing
 - c) Degeneracy
 - d) Wobble
- 8) _____ enzymes are used to cut DNA at specific sites.
- a) Restriction Exonuclease
 - b) Restriction Endonuclease
 - c) DNases
 - d) DNA Polymerases
- 9) _____ is most common initiation codon in prokaryotes and eukaryotes.
- a) AGU
 - b) UAU
 - c) AUG
 - d) UUU
- 10) DNA ligase enzyme is responsible for
- a) Cutting of DNA strands
 - b) Copying of DNA strands
 - c) Joining of DNA strands
 - d) Reverse transcription
- 11) DNA amplification is carried out using _____ technology.
- a) RFLP
 - b) Northern Blotting
 - c) PCR
 - d) DNA Microarray
- 12) Kohler and Milstein are credited with the discovery of _____ technology.
- a) Hybridoma
 - b) PCR
 - c) DNA Fingerprinting
 - d) Blotting
- 13) DNA probes are required during _____ experiments.
- a) DNA Footprinting
 - b) DNA Replication
 - c) Southern Blotting
 - d) PCR
- 14) _____ is used as vector during recombinant DNA technology.
- a) Cosmid
 - b) Primer
 - c) Probe
 - d) Clone



2. Answer **any seven** of the following : **14**
- i) Nucleosome
 - ii) Capping
 - iii) Okazaki Fragments
 - iv) Plasmids
 - v) Cloning
 - vi) Taq Polymerase
 - vii) DNA Probe
 - viii) Degeneracy
 - ix) Sigma (σ) factor.
3. A) Attempt **any two** of the following : **10**
- i) Explain RNA Polymerase enzyme in prokaryotes.
 - ii) Discuss the role of restriction enzymes and DNA ligase in recombinant DNA technology.
 - iii) Explain cloning as an application of biotechnology.
- B) Discuss the process of ELISA. **4**
4. Attempt **any two** of the following : **14**
- i) Discuss in detail the process of translation.
 - ii) Explain the process and applications of DNA fingerprinting.
 - iii) What is hybridoma ? Explain steps in monoclonal antibody production.
5. Attempt **any two** of the following : **14**
- i) Define blotting and explain the process of Southern blotting.
 - ii) Discuss any two experiments as evidences of DNA as genetic material.
 - iii) Explain post-transcriptional modifications in eukaryotic m-RNA.
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Seat No.	
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B.Sc. – III (Semester – VI) (New-CGPA) Examination, 2017
MATHEMATICS (Special Paper – XIII)
Integral Transforms

Time : 2 $\frac{1}{2}$ Hours

Max. Marks : 70

N.B. : 1) *All questions are compulsory.*
2) *Figures to the right indicate full marks.*

1. Choose the correct alternative for **each** of the following : **14**

1) $L\{e^{-at}t^n\} = \underline{\hspace{2cm}}$

- a) $\frac{n!}{(p+a)^n}$ b) $\frac{n!}{(p-a)^n}$ c) $\frac{n!}{(p+a)^{n+1}}$ d) None of these

2) $L\{\sin 3t\}$

- a) $\frac{3}{p^2+9}$ b) $\frac{p}{p^2+3}$ c) $\frac{p}{p^2+9}$ d) None of these

3) If $L\{f(t)\} = f(p)$ then $L\{e^{-at}f(t)\} = \underline{\hspace{2cm}}$

- a) $af(p)$ b) $f(p+a)$ c) $\frac{1}{a}f(a)$ d) None of these

4) If $L\{f(t)\} = f(p)$ then $L\left\{\frac{f(t)}{t^2}\right\} = \underline{\hspace{2cm}}$

- a) $\int_0^\infty \int_0^\infty f(p) dp dp$ b) $(-1)^2 \frac{d^2}{dp^2} f(p)$ c) $\frac{1}{p^2} f(p)$ d) None of these

5) If $L\{f(t)\} = f(p)$ then the initial value theorem states that

- a) $\lim_{t \rightarrow \infty} f(t) = \lim_{p \rightarrow 0} f(p)$ b) $\lim_{t \rightarrow 0} f(t) = \lim_{p \rightarrow \infty} pf(p)$
c) $\lim_{t \rightarrow 0} f(t) = \lim_{p \rightarrow 0} Pf(p)$ d) None of these

P.T.O.



- 6) If $L\{tsint\} = \frac{2p}{(p^2 + 1)^2}$ then value of integral $\int_0^{\infty} e^{-3t} tsint dt$ _____
- a) $\frac{3}{100}$ b) $\frac{2}{50}$ c) $\frac{3}{50}$ d) None of these
- 7) If $L^{-1}\{f(p)\} = f(t)$ then $L^{-1}\{f(kp)\} =$ _____
- a) $kf(kt)$ b) $\frac{1}{k}f(kt)$ c) $\frac{1}{k}f(\frac{t}{k})$ d) None of these
- 8) If $L^{-1}\{f(s)\} = f(t)$ then $L^{-1}\{f(s - a)\} =$ _____
- a) $e^{-at} f(t)$ b) $e^{iat} f(t)$ c) $e^{at} f(t)$ d) None of these
- 9) $L^{-1}\left\{\frac{1}{p-4}\right\} =$ _____
- a) e^{4t} b) e^{-4t} c) e^{2t} d) None of these
- 10) $| * | * | * | \dots$ (n times) = _____
- a) $\frac{t^n}{n!}$ b) $\frac{t^{n-1}}{(n-1)!}$ c) $\frac{t^{n-1}}{(n-1)}$ d) None of these
- 11) $L^{-1}\left\{\frac{p}{p^2 + a^2}\right\} =$ _____
- a) $\frac{\cos at}{a}$ b) Cosat c) $\frac{\cos at}{p}$ d) None of these
- 12) $F * G =$ _____
- a) $\int_0^t F(X) G(t - X) dX$ b) $\int_0^{\infty} F(X) G(t - X) dX$
- c) $\int_0^t f(X) G(X) dX$ d) None of these



13) If $y(x, t)$ is function of x and t then $L\left\{\frac{\partial y}{\partial t}\right\} = \text{_____}$

- a) $x\bar{y}(x, p) + y(x, 0)$
- b) $p\bar{y}(x, p) - y(x, 0)$
- c) $p\bar{y}(x, 0) - y(x, p)$
- d) None of these

14) If $y(x, t)$ is function of x and t then $L\left\{\frac{\partial^2 y}{\partial t^2}\right\} = \text{_____}$

- a) $P^2\bar{y}(x, p) - py(x, 0) - y_t(x, 0)$
- b) $P^2\bar{y}(x, p) + py(x, 0)$
- c) $P^2\bar{y}(x, p) - py_t(x, 0) - y(x, 0)$
- d) None of these

2. Attempt **any seven** of the following :

14

1) Find $L\{\sin t \cos t\}$.

2) Find Laplace transform of the function $f(t)$ where $f(t) = \begin{cases} \sin t & 0 < t < \pi \\ 0 & t > \pi \end{cases}$.

3) Find $L\{t \cosh 3t\}$.

4) State the change of scale property of Laplace transform.

5) Find $L^{-1}\left\{\frac{1}{\sqrt{p}}\right\}$.

6) Find $L^{-1}\left\{\frac{1}{(p+a)^n}\right\}$.

7) Evaluate $L^{-1}\left\{\frac{p+1}{p^2+6p+25}\right\}$.

8) Find $L^{-1}\left\{\frac{p}{p^2+2} + \frac{6p}{p^2-16} + \frac{3}{p-3}\right\}$.

9) State linearity property of Laplace transform.



3. A) Attempt **any two** of the following :

10

1) If $L\{f(t)\} = f(p)$ and $G(t) = \begin{cases} F(t-a) & t > a \\ 0 & t < a \end{cases}$

then show that $L\{G(t)\} = e^{-ap} f(p)$.

2) Evaluate $L^{-1} \left\{ \frac{4p+5}{(p-4)^2(p+3)} \right\}$

3) Solve $ty'' + y' + 4ty = 0$ if $y(0) = 3, y'(0) = 0$.

B) Find $L^{-1} \left\{ \log \frac{p+3}{p+2} \right\}$.

4

4. Attempt **any two** of the following :

14

1) Prove that $L \left\{ \frac{\sin t}{t} \right\} = \tan^{-1} \frac{1}{p}$ and hence find $L \left\{ \frac{\sin at}{t} \right\}$.

Does the $L \left\{ \frac{\cos at}{t} \right\}$ exist ?

2) Solve $(D^2 - 3)x - 4y = 0$

$$x + (D^2 + 1)y = 0, \quad t > 0$$

if $x = y = Dy = 0, Dx = 2$ when $t = 0$.

3) If $L^{-1}\{f(p)\} = F(t)$ then show that $L^{-1}\{f(ap)\} = \frac{1}{a} f\left(\frac{t}{a}\right)$.

5. Attempt **any two** of the following :

14

1) If $F(t)$ is a function of class A and if $L\{f(t)\} = f(p)$ then

$$L\{t^n f(t)\} = (-1)^n \frac{d^n}{dp^n} f(p).$$

2) Solve $(D^2 + 9)y = \cos 2t$ if $y(0) = 1, y\left(\frac{\pi}{2}\right) = -1$.

3) State and prove convolution theorem for inverse Laplace transform.



Seat No.	
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B.Sc. (Part – III) (Semester – VI) Examination, 2017
STATISTICS (Special Paper – XIII) (New CGPA)
Limit Theorems, Reliability and Queuing Theory

Time : 2½ Hours

Total Marks : 70

- N.B. :** 1) **All questions are compulsory and figures to the right indicate full marks.**
2) **Use of scientific calculators and statistical tables is allowed.**

1. Choose most appropriate alternative and rewrite the answers. 14

i) In M / M / 1 : ∞ / FIFO model the probability that the server is busy is _____

- a) ρ b) $1 - \rho$ c) $\frac{1}{\rho}$ d) $1 - \frac{1}{\rho}$

ii) If probability of survival for every independent component 0.5 then, reliability of a series system of 3 components will be $r(p) =$ _____

- a) 0.125 b) 0.250 c) 0.575 d) 1

iii) If $X_n \xrightarrow{P} x$ in as $n \rightarrow \infty$ then _____ as $n \rightarrow \infty$.

- a) $X_n \xrightarrow{P} k$ b) $X_n \xrightarrow{P} 2x$
c) $X_n \xrightarrow{P} (1 - x)$ d) $7X_n \xrightarrow{P} 7x$

iv) In queuing theory steady state condition will be achieved if _____

- a) arrival rate > service rate b) arrival rate = service rate
c) arrival rate < service rate d) calling population is infinite

v) In M / M / 1 : ∞ / FIFO model the parameter 1 represents _____

- a) number of customers b) number of service channels
c) number of arrivals d) service rate

vi) Ageing function will be same as reliability function if _____

- a) $t < 0$ b) $t > 0$ c) $t = 0$ d) $t = 5$

vii) Structure function for a parallel system of two components will be

 $\phi(x) =$ _____

- a) $1 - x_1x_2$ b) x_1x_2
c) $1 - (x_1 - 1)(x_2 - 1)$ d) $(1 - x_1)(1 - x_2)$



viii) If X_i are iid $B(1, P)$ random variables $\forall i = 1, 2, \dots, n$ then with usual notations

$\bar{X} = \frac{1}{n} \sum X_i$ converges to _____ in probability.

- a) P b) nP c) 0 d) 1

ix) If $\{X_n\}$ be a sequence of iid Poisson (1) random variables, then for sufficiently large n , $Z =$ _____ is $N(0, 1)$.

- a) \bar{X} b) $\sqrt{n} \bar{X}$ c) $\sqrt{n}(\bar{X} - 1)$ d) $\frac{1}{\sqrt{n}}(\bar{X} - 1)$

x) If X is a $B(10, 0.2)$ r.v. then upper bound for $P \left[\left| \frac{X}{2} - 1 \right| > 2 \right]$ will be

- a) 0.1 b) 0.025 c) 0.975 d) 0.004

xi) In usual notations pdf of n^{th} order statistic is given by _____

- a) $n! F(y) [F(y)]^{(n-1)}$ b) $n[F(y)] [1 - F(y)]^{(n-1)}$
 c) $n! f(y) [1 - F(y)]^{(n-1)}$ d) $n f(y) [F(y)]^{(n-1)}$

xii) While deriving the pdf of k^{th} order statistic we used the concept of _____

- a) multinomial distribution b) rectangular distribution
 c) normal distribution d) frequency distribution

xiii) In usual notations relation between hazard function and reliability function is $\lambda(t) =$ _____

- a) $\frac{R(t)}{R'(t)}$ b) $\frac{R'(t)}{R(t)}$ c) $\frac{R(t)}{f(t)}$ d) $\frac{-R'(t)}{R(t)}$

xiv) In $M/M/1 : \infty / \text{FIFO}$ model the probability that there are n customers in the system is

- a) ρ^n b) $1 - \rho^n$ c) $(1 - \rho) \rho^{(n-1)}$ d) $(1 - \rho) \rho^n$

2. Attempt **any seven** from the following :

14

- Define queue discipline.
- Define service time.
- State Chebysheve's inequality.
- Let X is Exponential (1) random variable. Find the upper bound for $P[|X - 1| > 3]$.



- e) Define order statistic.
 - f) For a random sample of size 2 from $U(0, 1)$ distribution, find the pdf of second order statistic.
 - g) Obtain structure function of a series system of 3 components.
 - h) Define minimal cut set and minimal path set.
 - i) Define convergence in quadratic mean.
3. A) Attempt **any two** from the following : 10
- i) State and prove weak law of large numbers for a sequence of iid random variables.
 - ii) Define hazard rate. Show that hazard rate of a series system of independent components is a sum of hazard rates of these components.
 - iii) Define K^{th} order statistic and obtain its distribution.
- B) State any four assumptions of $M/M/1 : \infty / \text{FIFO}$ model. 4
4. Attempt **any two** from the following. 14
- A) State and prove central limit theorem for iid random variables with common mean μ and variance σ^2 .
 - B) Show that hazard rate is constant iff underlying distribution is exponential.
 - C) Does there exists a random variable X for which $P[\mu - 2\sigma < X < \mu + 2\sigma] = 0.55$? Where $\mu = E(X)$ and $\sigma^2 = V(X)$. Justify using $B(100, 0.1)$ distribution.
5. Attempt **any two** from the following : 14
- A) Let Y_1 be the first order statistic corresponding to a random sample of size n from exponential(θ) distribution. Find the distribution of Y_1 . Discuss convergence of Y_1 in probability as $n \rightarrow \infty$.
 - B) Define :
 - i) a series system of 3 components
 - ii) parallel system of 3 components. Further obtain the reliability functions for these systems.
 - C) At a grocer's shop on an average one customer arrives every 5 minutes and service time is 15 customers per hour. Assume that all the conditions for the use of $M/M/1 : \infty / \text{FIFO}$ model are satisfied. i) Is the queue finite ? If no state all the reasons and if yes find a) probability that the server is busy b) average queue length c) average waiting time of a customer in the queue.
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Seat No.	
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**B.Sc. – III (Semester – VI) (New CGPA) Examination, 2017
GEOLOGY (Special Paper – XIII)
Phanerozoic Stratigraphy of India**

Time : 2½ Hours

Max. Marks : 70

- Instructions :** 1) **All questions are compulsory.**
2) **Figures to the right indicate full marks.**
3) **Draw neat labelled diagrams wherever necessary.**
4) **Answer to both Sections should be written in same answer book.**

1. Fill in the blanks with correct answer from given options : **14**

- 1) The last upheaval of the Himalayan mountain belt took place in _____
 - a) Lower-Middle Cretaceous
 - b) Miocene-Pliocene
 - c) Upper Cretaceous-Eocene
 - d) Pliocene-Pleistocene
- 2) The middle and upper Jurassic forms _____
 - a) Rajmahal
 - b) Jurassic of Cutch
 - c) Spiti
 - d) Salt range
- 3) The fossils of Physa occur in _____ beds underlying Deccan Traps.
 - a) Umia
 - b) Infratrappean
 - c) Chari
 - d) None of these
- 4) Dolomitic layers, containing the fossil brachiopod Neobolus, known as the Neobolus beds are found in _____
 - a) Salt range
 - b) Spiti
 - c) Jurassic of Cutch
 - d) None of these
- 5) Products shales are found in _____
 - a) Ordovician
 - b) Silurian
 - c) Devonian
 - d) Permian



2. Answer **any seven** of the following : **14**
- i) What is the age of Siwalik System ?
 - ii) On which rock Cambrian strata of Spiti lies over ?
 - iii) Names of series in upper Gondwana.
 - iv) Write any two characteristic features of Chari Series of Jurassic System.
 - v) Describe “Neobolus beds”.
 - vi) Give the ages of the Saline Series/Salt Marl.
 - vii) Names of series in upper Gondwana.
 - viii) Define Raniganj stage.
 - ix) Stratigraphic position of Bunter series.
3. A) Write short notes on **any two** of the following : **10**
- i) What is the stratigraphical significance of inter-trappean beds ?
 - ii) Explain Umria marine beds of Gondwana System.
 - iii) Marine transgression during Jurassic period.
- B) Flora and fauna found in Upper, Lower, Middle, Gondwana System. **4**
4. Answer **any two** of the following : **14**
- i) Write a detailed account on Jurassic of Cutch.
 - ii) Describe important characters of Deccan Traps of India.
 - iii) Describe in brief with stratigraphic sequence and lithology of Siwalik System.
5. Answer **any two** of the following : **14**
- i) Explain nature of ‘Main Boundary Fault’.
 - ii) Describe in detail Marine Transgressions.
 - iii) Describe in detail Kioto limestones.
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B.Sc. – III (Semester – VI) (New CGPA) Examination, 2017
MICROBIOLOGY (Special Paper – XIII)
Environmental Microbiology

Time : 2½ Hours

Max. Marks : 70

N. B. : i) **All questions are compulsory.**
ii) **Figures to the right indicate marks.**

1. Rewrite the sentences by selecting correct answer from given alternatives. **14**
- i) Ozone layer is reduced due to _____
- a) Radioactive waste b) Chlorofluorocarbons
c) PAN d) Hydrocarbons
- ii) _____ are non-biodegradable.
- a) Fertilizers b) Crop waste
c) Radioactive substance d) Agrochemicals
- iii) Respiratory diseases are caused due to _____
- a) Suspended particulate matter b) Methane
c) H₂S d) Fluoride compounds
- iv) Most hazardous metal pollution of automobile exhaust is _____
- a) Lead b) Iron
c) Mercury d) Copper
- v) _____ play an important role in leaching of uranium.
- a) E. coli b) Thiobacillus ferrooxidans
c) Bacillus Polymyxa d) Strepto verticillium spp.
- vi) Oil and grease are common in waste from _____ industry.
- a) Paper b) Sugar
c) Dairy d) Textile
- vii) Bhopal tragedy is a case of _____ pollution.
- a) Soil b) Water
c) Radioactive d) Air



3. A) Answer **any two** of the following questions in brief : **10**
- i) Explain various types of lakes.
 - ii) Give significance of lead as pollutant.
 - iii) Explain aeroconiscope.
- B) Explain control of Eutrophication. **4**
4. Answer **any two** of the following : **14**
- i) Write an essay of biological safety.
 - ii) Explain characteristics and treatment of dairy waste.
 - iii) Write a note on germ free animals.
5. Answer **any two** of the following : **14**
- i) Write an essay on municipal water purification.
 - ii) Explain effects of air pollution.
 - iii) Explain microbial-enhanced oil recovery.
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B.Sc. – III (Semester – VI) (New) (CGPA) Examination, 2017
ELECTRONICS (Special Paper – XIII)
Embedded System Design

Time : 2½ Hours

Max. Marks : 70

- Instructions :**
- 1) **All the questions are compulsory.**
 - 2) Figures to the **right** indicate **full marks.**
 - 3) Draw neat and labelled diagram **wherever necessary.**
 - 4) Use of log table is **allowed.**

1. Select correct alternatives from the following : 14

- 1) An electronic system designed for _____ application is called as embedded system.
a) General b) Dedicated c) Any d) None of these
- 2) An embedded firmware consists of _____ structure.
a) Superloop b) Only preprocessor
c) Only main () d) None of these
- 3) The C language consists of _____ keywords.
a) 32 b) 64 c) 8 d) 256
- 4) _____ statement is the output statement.
a) Printf b) Getch c) Scanf d) None of these
- 5) Out of following _____ has highest priority in C language.
a) Exponentiation b) Addition
c) Multiplication d) None of these
- 6) In embedded C program developed for 8951 μC , _____ must be included.
a) stdio.h b) reg51.h c) conio.h d) None of these



- 7) Mode 2 of microcontroller 8951 is _____ mode.
a) 8 bit autoreload b) 16 bit timer
c) 13 bit timer d) None of these
- 8) R × D line of microcontroller 8951 is used for serial _____ of data.
a) Transmission b) Reception c) Interruption d) None of these
- 9) For programming the firmware into target 8951 device _____ IDE is used.
a) Flash magic b) Keil microvision
c) Pony prog d) None of these
- 10) For serial programming of 8951 μC , the band rate should be
a) 19600 b) 1100 c) 9600 d) None of these
- 11) For temperature measurement _____ is the suitable sensor.
a) Transistor b) zener diode c) AD590 d) None of these
- 12) To generate triangular wave _____ should be interfaced to microcontroller.
a) ADC b) DAC
c) V to F converter d) None of these
- 13) Clock circuit is essential for
a) LCD b) Keyboard
c) Embedded system d) None of these
- 14) The data range of integer variable is
a) 2 bytes b) 4 bytes c) 8 bytes d) None of these

2. Answer **any seven** of the following :

14

- 1) Mention any four applications of embedded system.
- 2) Draw the circuit diagram for clock circuit of μC 8951.
- 3) Define the term constant in 'C' language.
- 4) Mention the data types of C language.
- 5) Mention logical operators of C language.
- 6) Give the function defined for time delay generator.
- 7) What are the registers in LCD ?
- 8) What is in system programming ?
- 9) What is superloop in embedded 'C' ?



3. A) Attempt **any two** of the following : **10**
- 1) Explain interfacing of relay with 8951 microcontroller.
 - 2) Explain various types of embedded system.
 - 3) Write embedded 'C' program to toggle all the bits of port P₁ with some delay using timer.
- B) Write a short note on structure of embedded C program. **4**
4. Attempt **any two** of the following : **14**
- 1) Describe with suitable diagram interfacing of ADC 0804 to microcontroller 8951.
 - 2) Write a program in embedded 'C' to blink the LED interfaced at P_{2.0}.
 - 3) Discuss steps involved in development of firmware in Kiel microvision IDE.
5. Answer **any one** of the following : **14**
- A) With the help of suitable hardware and software discuss development of embedded system for measurement of temperature.
- OR
- B) 1) Describe interfacing of LCD to 8951 microcontroller.
2) Write program in embedded C to generate a delay of 150 μs by using timer 0.
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B.Sc. (Part – III) (Semester – VI) (New CGPA Pattern) Examination, 2017
COMPUTER SCIENCE
Operating System – II (Special Paper No. – XIII)

Time : 2½ Hours

Max. Marks : 70

Instructions: 1) Figures to the **right** indicate **full** marks.
2) **All** questions are **compulsory**.

1. Choose and write correct answer from given four alternatives : **14**
- 1) In Linux a user can load or upload
 - a) I/O Modules
 - b) I/O Devices
 - c) Kernel Modules
 - d) File Base I/O
 - 2) Which command reduces the size of a file ?
 - a) pzip
 - b) gcat
 - c) pgcat
 - d) gzip
 - 3) Which command is used to find what is in your home directory ?
 - a) % List
 - b) % ls
 - c) % home
 - d) Either (a) or (c)
 - 4) Pipe symbol is represented by
 - a) ||
 - b) |
 - c) ^
 - d) \$
 - 5) Which is used to search files for specified words or patterns ?
 - a) Less
 - b) Srch
 - c) %src
 - d) Grep
 - 6) The hierarchy of a series of directories branching in a user system starts from
 - a) home
 - b) root
 - c) /home
 - d) /root
 - 7) Which command is used to print a file ?
 - a) print
 - b) ptr
 - c) lpr
 - d) None of the above



- 8) Which directory contains device special files ?
a) /etc b) /etc/dev c) /root/bin d) /dev
- 9) Shell is
a) Command Interpreter
b) Interface between Kernel and Hardware
c) Interface between user and applications
d) Command Compiler
- 10) Which control character signals the end of the input file ?
a) ctrl + a b) ctrl + b
c) ctrl + c d) ctrl + d
- 11) How do you rename file “new” to file “old” ?
a) mv new old b) move new old c) cp new old d) rn new old
- 12) Which represents the user home directory ?
a) / b) . c) . . d) ~
- 13) Which vi editor command copies the current line of the file ?
a) yy b) yw c) yc d) None of these
- 14) A process is identified by a unique
a) Pid b) Id
c) Processed d) Proid

2. Solve **any seven** of the following :

14

- 1) What is shell script ?
- 2) What is file ? Types of file.
- 3) Explain cut command.
- 4) Explain rm command.
- 5) Explain pwd command.
- 6) What is standard output operator ?
- 7) What is inode number ?
- 8) What is piping ?
- 9) Write features of Linux ?



3. A) Attempt **any two** of the following : **10**
- 1) Explain ls-l command in details.
 - 2) What is Vi Editor ? Explain its mode.
 - 3) Explain X window.
- B) Explain Background Process. **4**
4. Attempt **any two** of the following : **14**
- 1) What is a file system ? Explain the steps to mount and unmount the file.
 - 2) Explain grep command with example.
 - 3) Explain chmod command.
5. Attempt **any two** of the following : **14**
- 1) Explain architecture of linux system.
 - 2) What is shell ? Explain all its type.
 - 3) Explain following linux command.
 - a) mv
 - b) cd
 - c) ln
 - d) lpr
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Seat No.	
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B.Sc. – III (Semester – VI) (New CGPA) Examination, 2017
PHYSICS (Special Paper – XIV)
Electronics and Instrumentation

Time : 2½ Hours

Max. Marks : 70

- Instructions:** 1) **All questions are compulsory.**
2) **Figures to the right indicate full marks.**
3) **Use of calculator or log table is allowed.**
4) **Neat diagrams must be drawn wherever necessary.**

1. Select the correct alternative from the following : 14

- 1) The ideal op-amp has _____ bandwidth.
a) Infinite b) Finite c) Zero d) One
- 2) Virtual ground is a point of an op-amp circuit which draws _____ current.
a) No b) Infinite c) High d) Low
- 3) The frequency of unsymmetrical rectangular wave form of an astable multivibrator using 555 timer IC is given by
a) $\frac{0.72}{CR_A}$ b) $\frac{1.44}{CR_A}$ c) $\frac{1.44}{C(R_A + R_B)}$ d) $\frac{1.44}{C(R_A + 2R_B)}$
- 4) Output of timer is _____ of supply voltage.
a) Dependent b) Corresponds
c) Constant d) Independent
- 5) An SCR is turned off when _____
a) Anode current is reduce to zero
b) Gate voltage is reduced to zero
c) Gate is reverse biased
d) None of these
- 6) A triac is equivalent of two SCRs _____
a) In parallel b) In series
c) In inverse parallel d) None of these



- 6) Give the important features of liquid crystal displays.
 - 7) What is principle of resistance temperature transducer ?
 - 8) State the application of Ultra Visible (UV) spectroscopy.
3. A) Answer **any two** of the following : **10**
- 1) An Op-amp is used in non-inverting mode $R_1 = 1 \text{ k}\Omega$, $R_2 = 12 \text{ k}\Omega$, calculate the output voltage for the inputs of :
 - a) $V_i = 150 \text{ mV}$ and
 - b) $V_i = 2 \text{ V}$.
 - 2) Draw the structure of LED display and explain its operation.
 - 3) Explain principle and working of A.C. servomotor sensor.
- B) Derive an expression for voltage gain of non-inverting amplifier by using op-amp. **4**
4. Answer **any two** of the following : **14**
- 1) Explain the construction and working of Triac.
 - 2) Explain construction, working and characteristics of photo diode transducer.
 - 3) Write brief note on segmental displays using light emitting diode.
5. Answer **any one** of the following : **14**
- 1) Explain astable operation of IC 555 timer. Give its application as a voltage frequency convertor. Find the values of T_{OFF} and T_{ON} if astable mode of IC 555 timer consists of $R_A = 1 \text{ k}\Omega$, $R_B = 2 \text{ k}\Omega$ and $C = 1 \mu\text{F}$.
 - 2) Describe principle, construction and working of transmission electron microscopy.
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B.Sc. (Part – III) (Semester – VI) (New) (CGPA) Examination, 2017
CHEMISTRY (Special Paper – XIV)
Analytical and Industrial Organic Chemistry

Time : 2½ Hours

Max. Marks : 70

Instructions: 1) **All questions are compulsory.**
2) **Figures to the right indicate full marks.**
3) **Draw neat labelled diagrams and give equations wherever necessary.**

1. Select the most correct alternative from among those given below : **14**
- i) The general formula of synthetic anionic detergents is
a) ROSO_3Na b) RONa c) RCOONa d) RCOOH
- ii) The molecular weight of a condensation polymer is _____ the sum of the molecular weight of monomeric units condensed to form the polymer.
a) more than b) less than
c) equal to d) both (a) and (c)
- iii) Juice heater is used for _____ of proteins present in the cane juice.
a) Decomposition b) Hydrolysis
c) Coagulation d) Washing
- iv) Ethyl alcohol is manufactured by fermentation of
a) Proteins b) Molasses c) Bagasse d) Oils
- v) Polyester yarn is dyed with _____ dyes.
a) Direct b) Vat c) Reactive d) Disperse
- vi) Chemically _____ are crystalline alumino silicates.
a) Zeolites b) Plastics c) Rubbers d) Detergents
- vii) In gas chromatographic separations the stationary phase can be
a) Gas b) Liquid
c) Solid d) Both (b) and (c)

P.T.O.



- iv) Explain the importance of scouring of cotton fabric.
- v) What is denaturing of alcohol ? How is it done ?
- vi) How are fibres classified ?
- vii) What are biocatalytic reactions ? Give example.
- viii) What is R_f value ? R_f value is less than one – why ?
- ix) Explain packing and preparation of column as required in GSC.

3. A) Answer **any two** of the following : **10**

- i) Define – Detergents. Explain the terms anionic and cationic detergents with examples.
- ii) Write a note on microwave assisted reactions.
- iii) What is chromatography ? Classify chromatographic methods based on nature of mobile phase and stationary phase.

B) Write synthesis and uses of PVC. **4**

4. Answer **any two** of the following : **14**

- i) With a neat labelled diagram, discuss the hot process of manufacture of soap.
- ii) How is ethyl alcohol manufactured by fermentation of molasses ? Explain.
- iii) Explain the principle and experimental process of thin layer chromatography.

5. Answer **any two** of the following : **14**

- i) Discuss Ziegler-Natta polymerisation.
 - ii) Explain in brief the steps involved in refining of raw sugar.
 - iii) What is bleaching ? Discuss the process of cotton bleaching by using sodium hypochlorite.
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B.Sc. (Part – III) (Semester – VI) (New – CGPA) Examination, 2017
BOTANY (Special Paper – XIV)
Molecular Biology and Biotechnology

Time : 2½ Hours

Max. Marks : 70

- N. B. :** I) **All questions are compulsory.**
II) **All questions carry equal marks.**
III) **Draw neat labeled diagram wherever necessary.**
IV) **Figures to the right indicate full marks.**

1. Rewrite the following sentences choosing the correct alternative. 14
- 1) Ti plasmids that is used as a plant vector is obtained from _____
a) *Agrobacterium tumefaciens* b) *Agrobacterium rhizogenes*
c) *Agrobacterium radiobactor* d) *Thermus aquaticus*
 - 2) Operon hypothesis is putforth by _____
a) Jacob and Monod b) Watson and Crick
c) Gilbert and Mullar d) None of these
 - 3) Okazaki fragments are produced on the _____ strand of parent DNA.
a) Lagging b) Leading c) On both d) None of these
 - 4) In Southern blotting technique _____ paper is used.
a) Nitrocellulose b) Cellulose
c) Polythene d) Polypropylene
 - 5) In DNA purin bases are _____
a) Adenine and Guanine b) Thymine and Cytocine
c) Adenine and Thymine d) Guanine and Cytocine
 - 6) Totipotency means _____
a) Flowering in culture medium
b) Development of fruit from a flower in a culture
c) Development of an organ from a cell in culture medium
d) All of these



- 7) Molecular scissor used in genetic engineering is _____
- a) DNA Polymerase b) DNA ligase
c) Helicase d) Restriction endonuclease
- 8) The production of a large number of genetically similar plant through plant tissue culture is called _____
- a) Hybridoma technology
b) Recombinant DNA technology
c) Gene therapy
d) Micropropagation
- 9) DNA replication takes place during _____ phase.
- a) Interphase b) Metaphase
c) Anaphase d) Telophase
- 10) _____ technique is used to obtain hybrid between two species with profertilization barrier.
- a) Embryo rescue b) Protoplast fusion
c) Ovary culture d) Embryo implantation
- 11) The lac operon encodes three enzymes required for the metabolism of _____
- a) Glucose b) Maltose
c) Fructose d) Lactose
- 12) The first step in the Polymerase Chain Reaction (PCR) is _____
- a) denaturation b) primer extension
c) annealing d) cooling
- 13) cDNA libraries are useful for the study of _____
- a) cell specific gene expression
b) developmental stage specific gene expression
c) conditional gene expression
d) all of these
- 14) Taq polymerase is used in PCR because of its _____
- a) Low thermal stability b) High fidelity
c) High speed d) High thermal stability



2. Attempt the following : 14
- 1) Define denaturation.
 - 2) Name the forms of DNA.
 - 3) What is recombinant DNA ?
 - 4) Define DNA fingerprinting.
 - 5) Define gene.
 - 6) Enlist the enzyme involved in protoplast isolation.
 - 7) Give the names of marker and reporter genes used in the production of transgenic plant.
3. A) Attempt **any two** : 10
- 1) What is meant by recombinant DNA technology ? Add note on Southern blotting technique.
 - 2) What is tissue culture ? Briefly explain the Anther culture.
 - 3) Write in brief about DNA libraries.
- B) Describe structure of promoter. 4
4. Attempt **any two** of the following : 14
- 1) Describe DNA replication by semiconservative method.
 - 2) Describe micropropagation.
 - 3) What is vector ? Describe in brief about vectors.
5. Answer **any two** of the following : 14
- 1) Define genetic engineering. Describe any two physical methods of gene delivery.
 - 2) Describe polymerase chain reaction.
 - 3) Describe isolation of protoplast.
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**B.Sc. (Part – III) (Semester – VI) (New CGPA) Examination, 2017
ZOOLOGY (Special Paper – XIV)
Biotechniques and Applied Zoology**

Time : 2½ Hours

Max. Marks : 70

- N.B. :** 1) *All questions are compulsory.*
2) *Figures to the right indicate full marks.*
3) *Draw neat labelled diagrams wherever necessary.*

1. Select the appropriate answer from **each** of the following and rewrite the sentence. **14**
- 1) _____ is good source of fish oil.
a) Oil Sardine b) Pompret c) Mrigal d) Catla
 - 2) Silk is a secretion of silkworm from its specialized
a) Fat bodies b) Anal horns c) Spiracles d) Salivary gland
 - 3) Pearl is also called as
a) Moti b) Coral c) Hira d) Ratna
 - 4) In biological control of pests _____ are used.
a) Chemicals b) Fumigants
c) Biological agents d) Pheromones
 - 5) _____ deals with culture and capture of fishes and crustaceans like lobster, crab, shrimp etc.
a) Silviculture b) Aquaculture c) Pearl culture d) Apiculture
 - 6) The full form of PAGE is
a) Poly Acrylamide Gel Electrophoresis
b) Poly Amyl Gel Electrophoresis
c) Poly Amide Gel Electrophoresis
d) Poly Acyl Gel Electrophoresis

P.T.O.



- v) Economic importance of silk.
 - vi) Trap net.
 - vii) Varieties of silkworms.
 - viii) Ultracentrifuge.
 - ix) Silkworm bacterial diseases.
3. A) Answer **any two** of the following : **10**
- i) Give an account on applications of colorimeter.
 - ii) Write about the uses of Column Chromatography.
 - iii) Describe Off Shore Sole Fishery.
- B) Describe the biological control of crop pest. **4**
4. Answer **any two** of the following : **14**
- i) Define separation technique. Describe the thin layer chromatography.
 - ii) Write in brief about pearl culture and its applications.
 - iii) Give an account on Polyacrylamide Gel Electrophoresis and its applications.
5. Answer **any two** of the following : **14**
- i) Describe sericulture and its economic importance.
 - ii) Give an account on economic importance of fish products and by-products.
 - iii) Describe cryopreservation of gametes and its application.
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Seat No.	
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B.Sc. – III (Semester – VI) (New) CGPA Examination, 2017
MATHEMATICS (Special Paper – XIV)
Programming in C

Time : 2 ½ Hours

Max. Marks : 70

N.B. : 1) **All questions are compulsory.**
2) **Figures to the right indicate full marks.**

1. Choose the correct alternative for each of the following : **14**
- 1) The C language was developed along with the _____ operating system.
a) LINUX b) MS-Office c) UNIX d) XP
 - 2) The preprocessor directives are placed at _____ of a program.
a) The beginning b) Middle
c) The end d) Any where in the program
 - 3) The C-storage class has _____ number of specifiers.
a) 2 b) 4 c) 3 d) 6
 - 4) The qualifier _____ is used to tell explicitly the compiler that a variables value may be changed at any time by some external sources from outside the program.
a) Storage class b) Long
c) Unsigned d) Volatile
 - 5) With usual meanings, C-expression $14\% - 3$ evaluate the value _____.
a) 1.5 b) 5 c) 1 d) - 1
 - 6) The lowest operator of relative precedence of the relational and logical operators is _____.
a) == b) <<= c) && d) ||
 - 7) The _____ operator is used to link the related expressions together.
a) Comma b) Sizeof c) Pointer d) Member selection



- 8) The _____ specifier can be used to read strings with blank spaces.
a) %s b) %[] c) % wc d) % wsd
- 9) The _____ header file contains character function.
a) <math.h> b) <stdio.h> c) <ctype.h> d) <char.h>
- 10) The conversion specifier _____ is used to print integers in hexadecimal form.
a) \o b) \x c) \ox d) None of these
- 11) The sentinell-controlled loop is also known as _____ loop.
a) Finite repetition b) Infinite repetition
c) Definite repetition d) Indefinite repetition
- 12) The _____ statement is used to skip a part of the statements in loop.
a) Break b) Continue c) Count d) Struct
- 13) Multiway selection can be accomplished using an else – if statement or the _____ statement.
a) if_else b) GOTO c) While d) Switch
- 14) The expression ! (x! = y) can be replaced by the expression.
a) x==y b) x>=y c) x > y d) x!=y

2. Attempt **any seven** of the following :

14

- 1) Why and when do we use the # include directive ?
- 2) What does int main (void) mean ?
- 3) What are enumeration variables ? How are they declared ?
- 4) Write the C-arithmetic operators and their meaning.
- 5) State the general form of scanf function.
- 6) Explain the term conditional operator ?
- 7) Write the flowchart of exit controlled loop.
- 8) Write the general forms of goto and label statements.
- 9) Define the term multidimensional arrays.



3. A) Attempt **any two** of the following : 10
- 1) Explain the need for one-dimensional arrays.
 - 2) Write a note on the form of C functions.
 - 3) Give full note on the switch statement.
- B) Describe the term basic structure of C-programs. 4
4. Attempt **any two** of the following : 14
- 1) Name and describe the three looping structures in C.
 - 2) Discuss in detail C-data types.
 - 3) A computer manufacturing company has the following :
Monthly compensation policy to their sales-persons :
Minimum base salary : 1500.00
Bonus for every computer sold : 200.00
Commission on the total monthly sales : 2 percent since the prices of computers are changing, the sales price of each computer is fixed at the beginning of every month.
Write a C-program to compute a sales gross salary.
5. Attempt **any two** : 14
- 1) Give full information about the formatted output.
 - 2) Discuss the different forms of if statement in detail.
 - 3) a) What are the special operators in C ? Explain each of them.
b) Write a C-program to calculate average of numbers.
-



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B.Sc. (Part – III) (Semester – VI) Examination, 2017
STATISTICS (Special Paper – XIV) (New-CGPA Pattern)
C-Programming

Time : 2.30 Hours

Total Marks : 70

- Instructions** : i) **All questions are compulsory.**
ii) **Use of simple or scientific calculator is allowed.**
iii) **Figures to the right indicate full marks.**

1. Select most correct alternative :

14

- i) Who is called as Father of C Programming Language ?
a) Ken Thompson b) Dennis Ritchie
c) Tennis Ritchie d) Bell
- ii) Which of the following is a keyword in C ?
a) what b) of c) for d) than
- iii) The C program execution always begin with the function
a) begin() b) main[] c) start() d) main()
- iv) The assignment statement $a = a + b;$ is equivalent to
a) $b + = a;$ b) $a = +b;$ c) $a = 2a;$ d) none of these
- v) C variable cannot start with
a) An alphabet
b) A number
c) A special symbol other than underscore
d) Both b) and c)
- vi) Which of the following shows the correct hierarchy of arithmetic operations in C
a) $* / + -$ b) $* - / +$ c) $+ - / *$ d) $/ + * -$



vii) In switch statement, each case instance value must be _____
a) Constant b) Variable c) Special symbol d) None of these

viii) What will be the output of the following statement ?

```
int a = 10; a = 12%5;    printf ("%d", ++a);
```

a) 3.4 b) 2.4 c) 3 d) 11

ix) The operator + + is

a) an unary operator b) a binary operator
c) a relational operator d) none of these

x) In C, an expression $-20\% - 3$ results in

a) -6.66 b) -2 c) 2 d) 6.67

xi) If p is an integer pointer with initial value, say 3032, then after the operation $p = p - 1$; the value of p will be

a) 3031 b) 3032 c) 3021 d) none of these

xii) For **int** type variable, _____ is used as conversion specifier.

a) %d b) %f c) %c d) none of these

xiii) An array elements are always stored in _____ memory locations.

a) Sequential b) Random
c) Sequential and random d) None of these

xiv) A library function $\text{pow}(2,3)$ returns the value

a) 6 b) 8 c) 9 d) none of these

2. Answer **any seven** of the following :

14

- i) What is a keyword in C ?
- ii) State the rules for constructing integer constants.
- iii) Give the list of C logical operators with their meaning.
- iv) What is a `getchar()` ? What is its use ?



v) How to declare variables in C ?

vi) Give the syntax of ternary operator.

vii) Convert the following algebraic expression into C arithmetic expression :

$$\frac{\sin x}{|b-10|} + e^{3k}$$

viii) What is pointer in C ?

ix) What is a **return** statement ?

3. A) Answer **any two** of the following : 10

i) Explain **if...else** statement.

ii) Explain **do...while** statement.

iii) Write a C program for finding the remainder when **a** is divided by **b**, where **a** and **b** are any two integers.

B) Find the value of the variable **y** in the following : 4

int a = 10, b = 20, c = 35;

float y;

y = a + b/6-a*27.58/100 + c%7;

4. Answer **any two** of the following : 14

i) Explain *strlen()* and *strrev()*. Illustrate each by one example.

ii) Write a note on use defined functions.

iii) Explain *for* loop. Illustrate by one example.

5. Answer **any two** of the following : 14

i) Write a note on array.

ii) Write a C program for finding minimum of 3 numbers a, b and c.

iii) Write a C program for finding the addition of the following two matrices A and B :

$$A = \begin{bmatrix} 2 & 3 & 4 \\ 5 & 6 & 7 \end{bmatrix} \quad B = \begin{bmatrix} 10 & 10 & 10 \\ 7 & 7 & 7 \end{bmatrix}$$



2. Answer **any five** of the following : 14
- 1) Fissure vein deposit.
 - 2) Formation of laterites.
 - 3) Contact metasomatism.
 - 4) Epigenetic ore deposit.
 - 5) Syngenetic ore deposit.
 - 6) Crustification.
 - 7) Laterite.
 - 8) What are metalliferous mineral deposits ?
 - 9) What are non -metalliferous mineral deposits ?
3. A) Answer **any two** of the following : 10
- 1) Describe Kolar ore deposits.
 - 2) Indian copper deposits.
 - 3) Saddle reef.
- B) Write answer of **any one** of the following : 4
- 1) Gossan
 - 2) Tenor of ore.
4. Answer **any two** of the following : 14
- 1) Supergene enrichment process.
 - 2) What is hydrothermal replacement deposit ? Give Indian example.
 - 3) Describe any two essential conditions for the formation of hydrothermal deposits.
5. Answer **any two** of the following : 14
- 1) Explain the concept and need of conservation of minerals, give examples.
 - 2) Late magmatic deposition process.
 - 3) Explain Origin and distribution of Indian copper deposits.
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B.Sc. – III (Semester – VI) (New -CGPA) Examination, 2017
MICROBIOLOGY
Medical Microbiology (Special Paper No. – XIV)

Time : 2.30 Hours

Total Marks : 70

- N.B. :** 1) **All** questions are **compulsory** and carry **equal** Marks.
2) Draw a **neat** labelled diagram **wherever** necessary.
3) Figures to the **right** indicate **full** marks.

1. Rewrite the following sentences by choosing **correct** alternatives from given below :

14

- i) The gastric and duodenal ulcer is caused by _____
A) *Mycobacterium leprae* B) *Helicobacter pylori*
C) *Pseudomonas aeruginosa* D) *Proteus mirabilis*
- ii) Leprosy spreads by _____
A) Droplets B) Contacts
C) Mosquitoes D) Blood
- iii) Pyocyanin pigment is produced by _____
A) *Mycobacterium leprae* B) *Helicobacter pylori*
C) *Pseudomonas aeruginosa* D) *Proteus mirabilis*
- iv) Cholera toxin increases the activity of _____ enzyme in human intestinal cells.
A) Urease B) Adenyl cyclase
C) DNase D) Coagulase
- v) Levinson-Jonson medium is used for the cultivation of _____
A) *Mycobacterium leprae* B) *Escherichia coli*
C) *Pseudomonas aeruginosa* D) *Klebsiella pneumoniae*

P.T.O.



- vi) VDRL test is used for the detection of _____
- A) *Escherichia coli* B) *Hepatitis virus*
C) *Vibrio cholerae* D) *Treponema palidum*
- vii) Urinary tract infection is caused by _____
- A) *Klebsiella pneumoniae* B) *Escherichia coli*
C) *Proteus vulgaris* D) All of these
- viii) Genital blisters or ulcer caused by _____ type of virus.
- A) HSV-1 B) HSV-2
C) HIV D) Hepatitis
- ix) _____ is a antibiotic which inhibit growth of bacteria by inhibiting protein synthesis.
- A) Penicillin B) Streptomycin
C) Amphotericin B D) Quinolone
- x) _____ antibiotic used as antifungal antibiotic.
- A) Amphotericin B B) Sulphonamides
C) Cephalosporin D) Fluconazole
- xi) Plasmodium reproduces asexually in the _____
- A) Mosquitoes B) Human
C) Stagnant water D) Both A & B
- xii) Incubation period of Hepatitis B virus is _____
- A) 2-6 weeks B) 6-10 days
C) 2-6 years D) 2-6 months
- xiii) H1N1 viruses can be transmitted from one person to another person through _____
- A) Blood B) Droplets
C) Food D) All of these
- xiv) _____ bacteria used as biological warfare agent.
- A) *Bacillus anthracis* B) Bolivian HF C) Smallpox D) Ricin



2. Answer **any seven** of the following : **14**
- i) Define Lepromatous leprosy.
 - ii) What are negri bodies ?
 - iii) What is genital herpes ?
 - iv) Enlist virulence factors that promote protozoan colonization.
 - v) What is Inactivation and modification of drugs ?
 - vi) Acid fast staining.
 - vii) Enlist the antibiotic of nucleic acid inhibitors.
 - viii) What is oral thrush ?
 - ix) Enlist ideal characteristics of antibiotics.
3. A) Answer **any two** of the following : **10**
- i) Describe in brief hospital acquired infection.
 - ii) Discuss in detail mode of transmission and symptoms of cholarae.
 - iii) Describe in detail epidemiology and pathogenesis of Herpes virus.
- B) Give a detailed account on antibiotic sensitivity. **4**
4. Answer **any two** of the following : **14**
- i) Describe in detail rabies.
 - ii) Discuss in detail mechanism of drug resistance.
 - iii) What is AIDS ? Discuss in detail modes of transmission, pathogenesis, symptoms of AIDS. Add a note on its laboratory diagnosis.
5. Answer **any two** of the following : **14**
- i) Discuss in detail modes of transmission, pathogenesis, symptoms and treatment of HIV.
 - ii) Describe in detail account on the Swine flue virus.
 - iii) Give a detailed account on biological warfare.
-



- 7) In case of PI control system the output of the controller is linearly proportional to the
- the input error signal
 - time integral of the input error signal
 - both a and b
 - rate of change of the input error signal
- 8) The basic need of digital controller is
- ADC
 - Microcontroller
 - DAC
 - None of these
- 9) The _____ instrument is used to detect the electrical activity of the brain of human body.
- EMG
 - ECG
 - EEG
 - EOG
- 10) The _____ is the example of the open loop control system.
- traffic light control
 - servo-motor
 - room air conditioner system
 - automatic iron
- 11) In case of PID control system the basic component utilized is
- BJT
 - FET
 - UJT
 - Op-Amp
- 12) The frequency range employed for the ultrasound imaging is
- 1 to 15 MHz
 - 1 to 15 KHz
 - 1 to 15 GHz
 - none of these
- 13) The _____ control system is the composite control system.
- Proportional
 - ON-OFF
 - PID
 - Derivative
- 14) The change in pulse width utilize normally for control of
- Temperature
 - DC motor
 - Humidity
 - Soil moisture

2. Answer **any seven** of the following.

14

- Draw the ECG waveform with its label.
- Give the characteristics of control system.
- Give the symbols of ladder diagram.
- Define the resting and action bio-potential.
- Give the advantages and disadvantages of the PID control system.
- Draw the block diagram of EMG recorder.
- Give the salient features of LCR-Q meter.
- Enlist various knobs of CRO
- Give the applications of PLC.



3. A) Answer **any two** of the following. **10**
- 1) Explain the ultrasonic imaging system.
 - 2) Explain the conductivity meter with the block diagram.
 - 3) Explain the ON-OFF control system.
- B) Explain the digital multimeter (DMM) with the block diagram. **4**
4. Answer **any two** of the following. **14**
- 1) Explain the pulse oximeter with block diagram.
 - 2) Explain the servo-motor control system in detail with functional diagram.
 - 3) Explain DSO with the help of block diagram.
5. Answer **any one** of the following. **14**
- 1) Explain origin of the bio-potentials and explain in detail EEG recording system.
 - 2) a) Explain the detail architecture of the PLC.
b) Explain function generator with its applications.
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B.Sc. – III (Semester – VI) Examination, 2017
COMPUTER SCIENCE
Data Communication and Networking – II (New CGPA)
Special Paper – XIV

Time : 2.30 Hours

Max. Marks : 70

Instructions : 1) *All questions are compulsory.*
2) *Figure to the right place indicate full marks.*

1. A) Choose correct alternatives. **10**
- 1) _____ protocol is used for transforming mails on the internet.
a) POP b) IP c) SMTP d) HTTP
 - 2) A repeater take a weakened signal and _____ it.
a) Repeat b) Regenerate c) Resample d) Reroute
 - 3) _____ server uses distributed file service.
a) Print b) File c) Web d) Database
 - 4) Which of the following IP address class is multicast ?
a) Class A b) Class B c) Class C d) Class D
 - 5) Bridge works in which layer of the OSI model ?
a) Application layer b) Transport layer
c) Network layer d) Data link layer
 - 6) Pretty Good Privacy (PGP) is used in
a) browser security b) email security
c) FTP security d) none of these
 - 7) Bluetooth uses
a) frequency hopping spread spectrum
b) orthogonal frequency division multiplexing
c) time division multiplexing
d) none of the mentioned



- 8) In asymmetric key cryptography, the private key is kept by
- a) sender
 - b) receiver
 - c) sender and receiver
 - d) all the connected devices to the network
- 9) HTTP is _____ protocol.
- a) application layer
 - b) transport layer
 - c) network layer
 - d) none of the mentioned
- 10) Which of the following is not a valid file type on Linux ?
- a) Socket
 - b) Softlink
 - c) Inode
 - d) FIFO

B) State the following statements **true/false**.

4

- 1) TCP protocol is connection oriented protocol.
- 2) ARP protocol used to find the hardware address of a local device.
- 3) FTP protocols uses both TCP and UDP.
- 4) 10XXXXXX is the address range of a Class B network address in binary.

2. Answer **any seven** of the following :

14

- 1) What is meant by piconet ?
- 2) What is meant by Plain text and cipher text ?
- 3) SNMP and SMTP stands for.
- 4) What is the function of repeater ?
- 5) TLS and MIME stands for.
- 6) What is the role of network administrator in Linux ?
- 7) GPRS and SGM stands for
- 8) What is encryption and decryption ?
- 9) What is buffering ?



3. A) Answer **any two** of the following : **10**
- 1) Explain HTTP in detail.
 - 2) Explain Firewall in detail.
 - 3) Explain Samba server in detail.
- B) Explain Hub in detail. **4**
4. Answer **any two** of the following : **14**
- 1) Explain SMTP and POP in detail.
 - 2) Explain Cryptography in detail.
 - 3) Explain SSL Encryption in detail.
5. Answer **any two** of the following : **14**
- 1) Explain FTP server of Linux in detail.
 - 2) Explain Authentication Mechanisms in detail.
 - 3) What is compression ? Explain types of compression.
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Seat No.	
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B.Sc. – III (Semester – VI) (Old) Examination, 2017
ENGLISH (Compulsory)
Breakthrough

Time : 2 Hours

Total Marks : 50

N.B. : 1) ***All questions are compulsory.***
2) ***Figures to the right indicate full marks.***

1. Choose the correct alternative : **10**

- 1) A great law of human action that Tom discovered to make a person covet a thing was _____
 - a) To make the thing easy to do
 - b) To make the thing difficult to attain
 - c) To make the thing simple to attain
 - d) To neglect the thing

- 2) The new diamond necklace that Loisel bought to give it to Mme Forester was priced _____
 - a) Forty thousand francs
 - b) Thirty four thousand francs
 - c) Thirty-six thousand francs
 - d) Five hundred francs

- 3) Pyramus saw in the sand the footsteps of the _____
 - a) Tiger
 - b) Wolf
 - c) Fox
 - d) Lion

- 4) Pyramus and Thisbe decided to meet at the foot of a _____
 - a) White mulberry tree
 - b) Purple mulberry tree
 - c) Green mulberry tree
 - d) Pink mulberry tree



3. A) Answer **any two** of the following : 6
- 1) What is the theme of the poem “In the Bazaars of Hyderabad ” ?
 - 2) What is the speaker’s attitude to life on earth in the poem On Virtue ?
 - 3) Who will buy the things the goldsmiths make ?
- B) Answer **any two** of the following in brief : 4
- 1) Make a list of four ways in which you usually waste your time. How can you manage your time better ?
 - 2) Mahesh is a young Maharashtrian man working in a multinational company as a sales manager. He has recently been transferred to Kolkata. He is unfamiliar with the city and its weather, people, food, language and culture. Suggest ways in which Mahesh can successfully adapt himself to the new environment where he has to live and work.
 - 3) You are working as a bank manager in a private commercial bank. You have been given the target which you are unable to fulfill. You work overnight and could not sleep. You become irritable and tense. What would you do to reduce your stress ?
4. Answer **any one** of the following : 10
- 1) Write in detail the description of a cricket player you like most. Give the traits of his personality.
 - 2) Describe in detail your trip to North India.
5. Read the following passage and summarise it : 10
- It is very easy to acquire bad habits, such as eating too many sweets or too much food, or drinking too much fluid of any kind, or smoking. The more we do a thing, the more we tend to like doing it ; and if we do not continue to do it, we feel unhappy. This is called the force of habit and the force of habit should be fought against.
- Things which may be very good when only done from time to time, tend to become very harmful when done too often and too much. This applies even to such good things as work or rest. Some people form a bad habit of working too much and others of idling too much. The wise man always remembers that this is true about himself and checks any bad habit. He says to himself, “I am now becoming idle,” or “I like too many sweets,” or “I smoke too much” and then adds, “I will get myself out of this bad habit at once.”



One of the most widely spread of bad habits is the use of tobacco. Tobacco is now smoked or chewed by men, often by women and even by children, almost all over the world. It was brought into Europe from America by Sir Walter Raleigh, four centuries ago and has hence spread everywhere. I very much doubt whether there is any good in the habit, even when tobacco is not used excess; and it is extremely difficult to get rid of the habit when once it has been formed.

Alcohol is taken in almost all cool and cold climates and to a very much less extent in hot ones. Thus, it is taken by people who live in the Himalaya Mountains, but not nearly so much by those who live in the plains of India. Alcohol is not necessary in any way to anybody. Millions of people are beginning to do without it entirely : and once the United States of America have passed laws which forbid its manufacture or sale through out the length and breadth of their vast country. In Indian it is not required by the people at all and should be avoided by them altogether. The regular use of alcohol, even in small quantities, tends to cause mischief in many ways to various organs of the body. It affects the liver; it weakens the mental powers and lessens the general energy of the body.



Seat No.	
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B.Sc. – III (Semester – VI) Examination, 2017
PHYSICS (Special Paper – XIII)
Electrodynamics (Old)

Time : 2 Hours

Max. Marks : 50

- Instructions :** 1) *All questions are compulsory.*
2) *Figures to the right indicate full marks.*
3) *Draw neat diagrams wherever necessary.*
4) *Use of calculator and log tables is allowed.*

1. Select the correct alternative :

10

i) The drift velocity of a charged particle in crossed fields is independent of _____

a) \vec{E} b) \vec{B} c) Specific charge (q/m)d) \vec{V}

ii) The trajectory of a charged particle in mutually perpendicular crossed electric and magnetic fields is _____

a) cycloid

b) circle

c) helix

d) parabola

iii) The line integral of electric force per unit charge over a closed path is _____

a) emf

b) electric flux

c) magnetic induction

d) current

iv) Generation of motional emf is the principle of _____

a) battery

b) generator

c) photovoltaic cell

d) voltaic cell



3. A) Answer **any two** of the following : 6
- 1) Define self-inductance and state its unit.
 - 2) State and explain Ampere's law.
 - 3) Obtain expression for total power radiated by an electric dipole.
- B) Find the reflection and transmission coefficients for normal incidence at glass-air interface. Given : Refractive index of glass = 1.5 and refractive index for air = 1.0. 4
4. Answer **any two** of the following : 10
- 1) What is mutual inductance ? Derive Newmann formula for mutual inductance.
 - 2) Discuss the orthogonality of \vec{E} , \vec{H} AND \vec{K} vectors of EM wave.
 - 3) Explain total internal reflection of cm waves.
5. Answer **any one** of the following : 10
- 1) Show that a charged particle moves along a circular path with constant speed, in a uniform magnetic field $\left(\vec{B} \right)$.
 - 2) Explain Maxwell's correction for Ampere's law. Why correction was needed ?
-



Seat No.	
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B.Sc. – III (Semester – VI) (Old) Examination, 2017
CHEMISTRY
Physical Chemistry (Special Paper – XIII)

Time : 2 Hours

Max. Marks : 50

Instructions : i) **All questions are compulsory.**
ii) **Draw neat diagrams wherever necessary.**
iii) **Figures to the right indicates full marks.**

1. Choose the most correct alternative for **each** of the following and rewrite the sentence : 10
- i) The relationship between wavelength, frequency and velocity of light is given by equation
- a) λc b) $v = \frac{c}{\lambda}$ c) vc d) $\frac{\lambda}{c}$
- ii) For rotational transitions selection rule is
- a) $\Delta J = 3$ b) $\Delta J = -1$ c) $\Delta J = -2$ d) $\Delta J = \pm 1$
- iii) _____ molecule show pure rotational spectra in microwave region.
- a) HCl b) N₂ c) H₂ d) O₂
- iv) The liquid mixtures which distill with change in composition are called
- a) Azeotropic mixtures b) Azeotropes
c) Boiling mixtures d) Zeotropic mixtures
- v) Solution which does not obey Raoult's law at all concentrations and temperatures are called
- a) Ideal solution b) Non-ideal solution
c) Binary solution d) None of these



vi) For the reaction $N_{2(g)} + 3H_{2(g)} \rightleftharpoons 2 NH_{3(g)}$; van't Hoff reaction isotherm equation is

a) $W_{\max} = 2.303 RT$

b) $W_{\max} = - 2.303 R$

c) $W_{\max} = \log KP - RT$

d) $W_{\max} = 2.303 RT \log KP - 2 RT$

vii) For spontaneous process change in free energy is

a) Positive b) Negative c) Both a) and b) d) All of these

viii) The term fugacity has dimensions of

a) Pressure b) Temperature c) Volume d) Length

ix) For third order reaction, half life period $\left(t_{\frac{1}{2}}\right) =$

a) $\frac{1}{3a}$

b) $\frac{2}{3ak}$

c) $\frac{3}{2a^2k}$

d) $\frac{0.6931}{k}$

x) The reactions in which the reactants react in more than one way to give different products are called _____ reactions.

a) Competing b) Consecutive c) Chain d) Reversible

2. Answer **any five** of the following :

10

i) CO_2 does not show rotational spectra, but show vibrational spectra. Give reasons.

ii) Mole fraction of solution is unity. Explain.

iii) Write Gibb's-Helmholtz equation. Give significance of the terms involved in it.

iv) Define fugacity and activity.

v) Define consecutive reaction.

vi) What is temperature coefficient of reactions.

3. A) Answer **any two** of the following :

6

i) State and explain Raoult's law.

ii) Give the significance of Helmholtz free energy.

iii) Explain graphical method to find rate constant of third order reaction.

B) Calculate reduced mass and moment of inertia of HCl ; if bond length is

1.275 Å and atomic masses of H and Cl are 1.008 and 35. [$N = 6.023 \times 10^{23}$]

4



4. Answer **any two** of the following : **10**
- i) Derive thermodynamically law of mass action.
 - ii) Give in detailed account of collision theory.
 - iii) Describe vibrational spectra of diatomic molecule.
5. Answer **any two** of the following : **10**
- i) What are azeotropic mixtures ? Explain the distillation of solution with systems having maximum boiling point.
 - ii) 1.5 mole of water is vaporised reversibly at 99.5 C° and one atmosphere pressure. The work done during this process is 2905.4 J and heat of vaporisation of water is 39458 J. Calculate ΔH , ΔS , ΔA and ΔG for the process.
 - iii) Derive Arrhenius equation to calculate energy of activation.
-



- 8) _____ is called as antifertility vitamin.
a) Vit. D b) Vit. E c) Vit. A d) Vit. K
- 9) In mouth the salivary amylase enzyme digest starch into
a) fatty acids and glycerols b) amino-acids
c) lactose and galactose d) dextrin and maltose
- 10) Bowman's capsules are located in _____ region of kidney.
a) Cortex b) Medulla c) Pelvis d) Calyx

2. Answer **any five** of the following : **10**
- 1) Definition of respiration
 - 2) Functions of bile
 - 3) Cardiac cycle
 - 4) Draw neat labelled diagram of nerve cell
 - 5) Sarcomere
 - 6) Dialysis.
3. A) Answer **any two** of the following : **6**
- 1) Explain dialysis.
 - 2) Give an account of Vitamin K.
 - 3) Describe glycolysis.
- B) Physiology of gastric digestion. **4**
4. Answer **any two** of the following : **10**
- 1) Describe Vitamin C with reference to its sources, roles and deficiencies.
 - 2) Glycogenesis.
 - 3) Riboflavin.
5. Answer **any one** of the following : **10**
- 1) Describe the ultra structure of nephron and add a note on urine formation.
 - 2) Describe the molecular mechanism of the muscle contraction.
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B.Sc. – III (Semester – VI) (Old) Examination, 2017
MATHEMATICS (Special Paper – XIII)
Metric Spaces

Time : 2 Hours

Max. Marks : 50

Instructions : i) **All questions are compulsory.**
ii) **Figures to the right indicate full marks.**

1. Choose correct alternative : 10
- 1) The union of infinite number of closed sets of a metric space is
a) Open b) Closed c) Not closed d) None of these
 - 2) Every convergent sequence in metric space is
a) Cauchy sequence b) Divergent
c) Oscillatory d) None of these
 - 3) If A is the set $(0, 1)$ then its diameter $d(A) =$
a) 0 b) ∞ c) 1 d) $-\infty$
 - 4) The function $f : (0, 1) \rightarrow \mathbb{R}$, defined by $f(x) = \frac{1}{x}$ is
a) Uniformly continuous b) Not uniformly continuous
c) Compact d) Continuous on \mathbb{R}
 - 5) The mapping $\rho : \mathbb{R} \times \mathbb{R} \rightarrow \mathbb{R}$, defined by $\rho(x, y) = |x - y|$; $\forall x, y \in \mathbb{R}$, then ρ is called
a) Discrete metric b) Absolute value metric
c) Pseudo metric d) None of these
 - 6) Every compact metric space is
a) Complete and not bounded b) Complete and totally bounded
c) Bounded and not complete d) Complete and not totally bounded
 - 7) Let $f(x) = x^2$ on $[0, 2)$ be a real valued function. Then f attains the maximum value at the point
a) $x = 0$ b) $x = 1$ c) $x = 2$ d) $x = 4$

P.T.O.



8) Let $X = \mathbb{R}$ and $F_n = \left(0, \frac{1}{n}\right]$ then

a) F_n 's are closed

b) $\bigcap_{n=1}^{\infty} F_n = \phi$

c) $\bigcap_{n=1}^{\infty} F_n \neq \phi$

d) None of these

9) Let $f : \mathbb{R} \rightarrow \mathbb{R}$ and $a \in \mathbb{R}$. If f is not continuous at $x = a$ then

a) $W[f; a] > 0$ b) $W[f; a] < 0$ c) $W[f; a] = 0$ d) None of these

10) Let $X = [0, 1]$ with absolute value metric, then $S\left(\frac{1}{2}; \frac{1}{4}\right)$ is

a) $\left[\frac{1}{4}, \frac{3}{4}\right)$

b) $\left[0, \frac{3}{4}\right)$

c) $\left(\frac{1}{4}, \frac{3}{4}\right)$

d) $\left(0, \frac{3}{4}\right)$

2. Attempt **any five** of the following :

10

1) Every convergent sequence is Cauchy sequence.

2) Show that every finite subset of metric space is totally bounded.

3) If A is a closed subset of a compact metric space (X, d) , then metric space (A, d) is compact.

4) Prove that, every singleton set in \mathbb{R} is closed.

5) If $T : X \rightarrow X$ is defined as $Tx = x^2$ where $X = \left[0, \frac{1}{3}\right]$, then T is contraction on

$\left[0, \frac{1}{3}\right]$.

6) Let E be a compact subset of \mathbb{R} , then it is closed and bounded.



3. A) Attempt **any two** of the following : 6

- 1) The function ρ defined by $\rho(x, y) = |x - y|$ is metric for set R . Prove that (R, ρ) is metric space.
- 2) If T is contraction on X and if $x_n \rightarrow x$ then prove that $Tx_n \rightarrow Tx$.
- 3) Let (M, ρ) be metric space and let a be point in M . If $\lim_{x \rightarrow a} f(x) = L$ and

$$\lim_{x \rightarrow a} g(x) = N \text{ then } \lim_{x \rightarrow a} (f(x) - g(x)) = L - N.$$

B) If $s = \{s_n\}_{n=1}^{\infty}$ and $t = \{t_n\}_{n=1}^{\infty}$ are in l^2 then $s + t = \{s_n + t_n\}_{n=1}^{\infty}$ is in l^2 and

$$\left(\sum_{n=1}^{\infty} (s_n + t_n)^2 \right)^{1/2} \leq \left(\sum_{n=1}^{\infty} s_n^2 \right)^{1/2} + \left(\sum_{n=1}^{\infty} t_n^2 \right)^{1/2}. \quad 4$$

4. Attempt **any two** of the following : 10

- 1) If (M, ρ) is complete metric space and A is closed subset of M then (A, ρ) is also complete.
- 2) If $x = (x_1, x_2), y = (y_1, y_2)$ are only two points in R^2 , we can define metric $\rho(x, y) = \max \{ |x_1 - y_1|, |x_2 - y_2| \}$. To find $\rho: R^2 \times R^2 \rightarrow R$ for metric space. Prove that (R^2, ρ) is metric space.
- 3) If G_1 and G_2 are open subset of metric space M , then prove that $G_1 \cap G_2$ is also open.

5. Attempt **any one** of the following : 10

- 1) If f is continuous at $a \in R'$ and $\{x_n\}_{n=1}^{\infty}$ be any sequence of real number converges to a then show that $\lim_{n \rightarrow \infty} f(x_n) = f(a)$.
- 2) Let (M, ρ) is complete metric space for each $N \in I$. Let F_n be the closed bounded subset of M such that
 - a) $F_1 \supset F_2 \supset F_3 \supset \dots \supset F_n \supset F_{n+1} \supset \dots$
 - b) $\text{dia } F_n \rightarrow 0 \text{ as } n \rightarrow \infty$

Then $\bigcap_{n=1}^{\infty} F_n$ contains Precisely one point.





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B.Sc. – III (Semester – VI) (Old) Examination, 2017
MICROBIOLOGY
Microbial Genetics (Special Paper – XIII)

Time : 2 Hours

Max. Marks : 50

Instructions: 1) **All questions are compulsory.**
2) **Figures to the right indicate full marks.**

1. Rewrite the sentences after choosing correct answer from the given alternatives. **10**

- 1) In the Lac-operon the genes in the operon are
 - A) Always expressed
 - B) Never expressed
 - C) Only expressed when lactose is present
 - D) Only expressed when lactose is absent
- 2) Helix unwinding during replication is accomplished by
 - A) DNA gyrase
 - B) DNA helicases
 - C) DNA polymerase I
 - D) DNA polymerase II
- 3) The plasmid vectors that are specifically designed to replicate in two different hosts are called as
 - A) Shuttle vectors
 - B) Plasmids
 - C) Cosmid
 - D) Replacement vectors
- 4) Folded fiber model of *E. Coli* chromosome was proposed by
 - A) Worcel et al.
 - B) Baltimore
 - C) Khurana
 - D) Pettijohn and Hetcht
- 5) When two mutations in a region of DNA cause negative Cis-trans test that region is called
 - A) Muton
 - B) Cistron
 - C) Replicon
 - D) Gene
- 6) Okazaki fragments are synthesized in _____ direction.
 - A) Opposite
 - B) Same
 - C) Any
 - D) No relation of the replication fork

P.T.O.



- viii) How small nanometer is _____
a) 10^{-9} m b) 10^{-23} m c) half million meter d) 10^{-10} m
- ix) Size of the nanoparticle is _____.
a) 10 – 20 nm b) 20 – 30 nm c) 5 – 10 nm d) 30 – 40 nm
- x) The materials which are used for structural applications in the field of medicine are
a) biomaterials b) metals c) composites d) alloys
2. Answer **any five** of the following : **10**
- i) What is malleability and ductility ?
 - ii) What are polymers ?
 - iii) State any four applications of ceramics.
 - iv) What is a composite material ?
 - v) Define nanophase materials.
 - vi) What are biomaterials ?
3. A) Answer **any two** of the following : **6**
- i) Discuss the thermal properties of the materials.
 - ii) What is meant by thermoplastic polymers ? Explain with example.
 - iii) What are the properties of composites ?
- B) Write a note on applications of nanomaterials. **4**
4. Answer **any two** of the following : **10**
- i) What is meant by addition and condensation polymerisation ? Give example of each.
 - ii) What are ceramic materials ? Explain electric properties of ceramics.
 - iii) Explain chemical bath deposition method for thin films.
5. Answer **any one** of the following : **10**
- i) Discuss the classification of materials. Explain in brief mechanical properties of materials.
 - ii) a) Explain classification of polymers and
b) Explain applications of biomaterials.
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B.Sc.– III (Semester – VI) (Old) Examination, 2017
CHEMISTRY (Special Paper – XIV)
Inorganic Chemistry

Time : 2 Hours

Max. Marks : 50

- Instructions:** 1) *All questions are compulsory.*
2) *Draw neat diagram and give equation wherever necessary.*
3) *Figures to right indicate full marks.*

1. Select the correct alternative for the following and rewrite the sentences. **10**
- 1) The electronic configuration of Americium is
 - a) $[\text{Rn}] 5f^7 6d^0 7s^2$
 - b) $[\text{Rn}] 5f^7 6d^1 7s^2$
 - c) $[\text{Rn}] 5f^6 6d^0 7s^2$
 - d) $[\text{Rn}] 5f^6 5d^1 7s^2$
 - 2) Idea of super conductors was introduced by
 - a) Bloch
 - b) Kamerlingh Onnes
 - c) Pauling
 - d) Drude
 - 3) (3c – 2e) bonds are present in
 - a) $\text{B}_3\text{M}_3\text{H}_6$
 - b) XeO_3
 - c) XeO_4
 - d) B_2H_6
 - 4) Atmospheric corrosion involves _____ heterogeneous system.
 - a) Solid-solid
 - b) Solid-gas
 - c) Liquid-gas
 - d) Liquid-solid
 - 5) In carbonyl compound M is _____ while CO is
 - a) Lewis acid, Lewis base
 - b) Lewis base, Lewis acid
 - c) Acid, base
 - d) Electron donar, electron acceptor
 - 6) The name of the element with atomic number 120 is
 - a) Un-bi-nilium
 - b) Un-di-nilium
 - c) Bi-un-unium
 - d) Un-bi-unium
 - 7) Germanium doped with acceptor impurity is _____ conductor.
 - a) Super
 - b) n-type
 - c) P-type
 - d) Mixed oxide
 - 8) In XeF_2 molecule Xe shows _____ hybridization.
 - a) SP
 - b) SP^2
 - c) SP^3
 - d) SP^3d



9) Corrosion is electrochemical process that involves anodic _____ of metals.

- a) Adsorption b) Dissolution c) Association d) Co-agulation

10) Borarine undergoes _____ reaction.

- a) Substitution b) Addition c) Reduction d) Oxidation

2. Answer **any five** of the following **10**

- 1) Lanthanides are called innertransition elements why ?
- 2) What are the applications of super conductors ?
- 3) Draw the structure of P_4O_{10} .
- 4) Define immersed corrosion.
- 5) Describe the synthesis of alkyl-beryllium compounds.
- 6) Mention methods of separation of lanthanides.

3. A) Answer **any two** of the following : **6**

- 1) Explain the factors affecting the corrosion.
- 2) Discuss the structure SO_2 molecule.
- 3) Write the name, symbol and atomic number of the lanthanides.

B) Explain the different properties of metallic solids. **4**

4. Answer **any two** of the following : **10**

- 1) What are lanthanides ? Explain the ion exchange method of separation in detail.
- 2) What is superconductivity ? Describe the structure of 1-2-3 superconductor.
- 3) Describe the structure of borazine.

5. Answer **any two** of the following : **10**

- 1) Explain IUPAC nomenclature system of super heavy elements and name any two of the elements having atomic number greater than 100.
 - 2) What is metallic bond ? Discuss the band theory of metals.
 - 3) Draw and explain the structure of diborane.
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**B.Sc. – III (Semester – VI) (Old) Examination, 2017
BOTANY (Special Paper – XIV)
Systematics of Angiosperms**

Time : 2 Hours

Max. Marks : 50

1. Rewrite the following sentences by choosing correct answer from the given alternatives : 10
- 1) The elongation of internode between stamens and carpel is called _____
a) Anthophore b) Androphore c) Gynophore d) Carpophore
 - 2) Gnetalean theory was proposed by _____
a) Saporta and Marion b) Wettstein
c) Markgraf d) P. Maheshwari
 - 3) _____ ovary is supposed to be more advanced.
a) Superior b) Half superior
c) Inferior d) Half Inferior
 - 4) _____ includes the study of pollen grains and spores.
a) Morphology b) Anatomy c) Embryology d) Palynology
 - 5) _____ tissue is polyploid.
a) Tapetum b) Parietal
c) Epidermal d) Pollen mother cell
 - 6) Most common type of ovule in angiosperms is _____
a) Orthotropus b) Anatropous
c) Hemianatropous d) Campylotropous
 - 7) *Allium* type of embryo sac is _____
a) Monosporic b) Bisporic
c) Tetrasporic d) None of these
 - 8) When birds pollinate the flowers it is called _____
a) Entomophily b) Chiropterophily
c) Ornithophily d) None of these



- 9) Endosperm tissue is _____
a) Haploid b) Diploid c) Triploid d) Tetraploid
- 10) Coconut fruit is dispersed by _____
a) Wind b) Birds c) Insect d) Water

2. Answer **any five** of the following : **10**
- 1) Give any four primitive characters of flower.
 - 2) What is microsporogenesis ?
 - 3) Sketch and label typical monosporic embryo sac.
 - 4) Define Heterostyly.
 - 5) Give economic importance of family-Rutaceae with example.
 - 6) Give distinguishing character of family Capparidaceae.
3. A) Write short notes on **any two** of the following : **6**
- i) Describe Bennettitalean theory of Angiosperms.
 - ii) Write on role of cytology in relation to taxonomy.
 - iii) Describe Halobial endosperm.
- B) Describe monosporic (*Polygonum type*) embro sac. **4**
4. Answer **any two** of the following : **10**
- i) Give salient features of Engler and Prantl's system of classification.
 - ii) Write note on dispersal of fruit and seeds.
 - iii) Give the distinguishing characters of any one of the following families with economic importance.
a) Apocynaceae
b) Poaceae.
5. Answer **any two** of the following : **10**
- i) Describe types of ovules studied by you.
 - ii) Describe the development of embryo in *Capsella*.
 - iii) Describe Adaptation for entomophily and ornithophily.
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**B.Sc. (Part – III) (Semester – VI) (Old) Examination, 2017
ZOOLOGY (Special Paper – XIV)
Endocrinology, Environmental Biology and Toxicology**

Time : 2 Hours

Max. Marks : 50

- N.B. :** 1) *All questions are compulsory.*
2) *Figures to the right indicate full marks.*
3) *Draw neat labelled diagrams wherever necessary.*

1. Select the appropriate answer from **each** of the following and rewrite the sentence : **10**
- Increase in concentration of toxicants from one link in food chain to another link is known as
 - Bioaccumilation
 - Biocontemination
 - Bioremediation
 - Biomagnification
 - DDT, Aldrin and dia-aldrin are _____ pesticides, which are extremely persistent and accumulate in various tissue.
 - organo-chlorine
 - organo-phosphate
 - carbonate
 - pyrethroide
 - Conservation of plants and animals in zoos, botanical gardens and laboratories is known as _____ conservation.
 - In-situ
 - Ex-situ
 - In-vivo
 - Ex-vivo
 - The process of burning of municipal solid waste is known as
 - Land filling
 - Incineration
 - Vermicomposting
 - Biocomposting
 - In mytilus the adaptation for attachment to substratum is
 - muscular foot
 - cement gland
 - byssus thread
 - pedal disc
 - _____ hormone increases the metabolic rate.
 - STH
 - Insulin
 - Thyroxine
 - Testosterone

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B.Sc. III (Semester – VI) (Old) Examination, 2017
MATHEMATICS (Special Paper – XIV)
Numerical Analysis

Time : 2 Hours

Max. Marks : 50

- N.B. :** 1) *Use of scientific calculators are allowed.*
2) *All questions are compulsory.*
3) *Figures to the right indicate full marks.*

1. Choose the correct alternative :

10

1) Which one of the following result is correct ?

a) $\Delta x^n = nx^{n-1}$

b) $\Delta x^{(n)} = nx^{(n-1)}$

c) $\Delta^n e^x = e^x$

d) $\Delta \cos x = -\sin x$

2) $\Delta \tan^{-1} x =$ _____

a) $\tan^{-1} \left(\frac{2h}{1+hx+x^2} \right)$

b) $\tan^{-1} \left(\frac{h}{1+hx-x^2} \right)$

c) $\tan^{-1} \left(\frac{h}{1+hx+x^2} \right)$

d) None of these

3) If $f(x) = e^x$ then $\Delta^6 e^x =$ _____

a) $(e^h + 1)^6 e^x$

b) $(e^h - 1)^6 e^x$

c) $(e^h - 1)^6 e^{-x}$

d) $(e^h - 1)e^{2x}$

4) The order of the difference equation $y_{n+2} - 2y_n + y_{n-1} = 1$ is

a) third

b) two

c) one

d) four

5) If the roots are real and equal (i.e. $\lambda_1 = \lambda_2$) then C.F. = _____

a) $(c_1 + c_2)(\lambda_1)^n$

b) $(c_1 + c_2 n)(\lambda_1)^n$

c) $(c_1 + c_2 n)\lambda_1$

d) None of these



- 6) The solution of $(E^2 - 4E + 3)y_n = 0$ is
- a) $c_1(-1)^n + c_2(-3)^n$ b) $c_1 + c_23^n$
 c) $c_12^n + c_2$ d) $c_1 - c_22^n$
- 7) Simpson's $\left(\frac{1}{3}\right)^{\text{rd}}$ rule is obtained by putting $n =$ _____
- a) 1 b) 3 c) 2 d) None of these
- 8) The exact value of $\int_0^1 \frac{1}{1+x} dx$ is _____
- a) 0.6931 b) 0.7031 c) 0.3169 d) 0.6831
- 9) If the given data is not equally spaced and interpolation is near end of the data then _____ interpolation formula is used.
- a) Lagrange's b) Newton's backward difference
 c) Newton's forward difference d) None of these
- 10) Extrapolation is defined as _____
- a) Extrapolation is the process of estimating the value of a function outside the given range of values
 b) Extrapolation is the process of estimating the value of a function inside the given range of values
 c) Both a) and b) are true
 d) None of these

2. Attempt **any five** of the following :

10

- 1) Evaluate $\Delta(e^x \log 2x)$.
- 2) With usual notation prove that $\delta = E^{\frac{1}{2}} - E^{-\frac{1}{2}}$.
- 3) Solve $u_{n+2} - 2u_{n+1} + u_n = 0$.
- 4) State Trapezoidal rule for integration.
- 5) State Lagrange's interpolation formula for the data containing 4 arguments x_0, x_1, x_2 and x_3 .
- 6) From $y_n = A2^n + B(-3)^n$, derive a difference equation by eliminating the constant.



3. A) Attempt **any two** of the following : 6

1) Use Lagrange’s formula to find f (10) given

x	5	6	9	11
f (x)	12	13	14	16

2) Usual notation prove that $\Delta = E\nabla = \nabla E$.

3) Evaluate $\int_0^1 \frac{x^2}{1+x^3} dx$ by using Simpson’s $\left(\frac{3}{8}\right)^{th}$ rule. Take h = 0.25.

B) Solve $y_{n+2} - 2y_{n+1} + y_n = n^2 2^n$. 4

4. Attempt **any two** of the following : 10

1) Find the missing y_x values from the first difference provided.

y_x	0	-	-	-	-	-
Δy_x	0	1	2	4	7	11

2) Using Newton’s backward difference formula, construct an interpolating polynomial of degree 3 for the data.

$f(-0.75) = -0.0718125, f(-0.5) = -0.02475,$

$f(-0.25) = 0.3349375, f(0) = 1.10100$. Hence find $f\left(-\frac{1}{3}\right)$.

3) Solve $y_{x+1}y_x + (x + 2)y_{x+1} + xy_x + x^2 + 2x + 2 = 0$.

5. Attempt **any one** of the following : 10

1) State and prove Simpson’s $\left(\frac{1}{3}\right)^{rd}$ rule. Hence evaluate the integral $\int_0^2 e^{x^2} dx$ taking the 10 intervals.

2) If $y = f(x)$ takes the values $y_0, y_1, y_2 \dots y_n$ corresponding to the values $x_0, x_1, x_2, \dots x_n$. Then prove that

$$y_p = y_0 + p\Delta y_0 + \frac{p(p-1)}{2!} \Delta^2 y_0 + \frac{p(p-1)(p-2)}{3!} \Delta^3 y_0 + \dots + \frac{p(p-1)(p-2)\dots(p-n+1)}{n!} \Delta^n y_0$$



- vi) If the same factorial effect is confounded in all the replications, it is known as
- a) partial confounding
 - b) complete confounding
 - c) conservative confounding
 - d) none of the above
- vii) If in a randomized block design having five treatments and four replications, a treatment is added, the increase in error degrees of freedom will be
- a) 1
 - b) 2
 - c) 3
 - d) 4
- viii) Large size plots receiving the treatments in a split plot design are called
- a) main plots
 - b) whole plots
 - c) both (a) and (b)
 - d) neither (a) nor (b)
- ix) Replication in an experiment eliminate
- a) human bias
 - b) competition among neighbouring plots
 - c) heterogeneity among blocks
 - d) none of the above
- x) Local control in experimental designs is meant to
- a) increase the efficiency of the design
 - b) reduce experimental error
 - c) to form homogeneous blocks
 - d) all the above

2. Explain **any five** from the following :

10

- i) Situations where missing plot technique is applicable.
- ii) Treatment.
- iii) Layout of an experiment.
- iv) Interaction between factors.
- v) Orthogonal contrast.
- vi) Main effects in 2^2 factorial experiment.



3. A) Answer **any two** of the following : **6**
- i) Explain the concept of factorial experiment.
 - ii) Explain the principle of replication in design of experiments.
 - iii) Give assumptions and mathematical model of CRD.
- B) Explain the procedure of obtaining the estimate of one missing value in RBD. **4**
4. Answer **any two** of the following : **10**
- i) What is Randomized Block Design (RBD) ? Give its mathematical model and analysis of variance table (ANOVA).
 - ii) Explain the Yate's procedure of obtaining main effects and interactions in 2^3 factorial experiment.
 - iii) For analysis of variance with one way classification show that $T.S.S = S.S.t + S.S.E$.
5. Answer **any two** of the following : **10**
- i) Describe split plot design. Give its mathematical model.
 - ii) What is confounding ? Distinguish between total and partial confounding.
 - iii) Describe Latin Square Design (LSD). Give its layout and ANOVA table for 4×4 LSD.
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B.Sc. – III (Semester – VI) (Old) Examination, 2017
PHYSICS (Special Paper – XV)
Atomic, Molecular Physics and Quantum Mechanics

Time : 2 Hours

Max. Marks : 50

- N. B. :** i) **All questions are compulsory.**
ii) **Figures to the right indicate full marks.**
iii) **Use of log table or scientific calculator is allowed.**
iv) **Draw neat diagrams wherever necessary.**

1. Select correct alternative :

10

- i) Most intense line in a doublet corresponds to _____
a) Maximum j value b) J and l change in the same way
c) Both conditions a) and b) d) Maximum l value
- ii) The separation between two successive energy levels in harmonic oscillator is _____
a) $\hbar\omega$ b) $\hbar\omega/2$ c) $\frac{3}{2}\hbar\omega$ d) $\frac{2}{3}\hbar\omega$
- iii) In stark effect the number of split energy levels corresponding to a given j value is given by _____
a) $2j + 1$ b) $\frac{2j+1}{2}$ c) $2(2j + 1)$ d) $4(2j + 1)$
- iv) The Hamiltonian operator is given by _____
a) $\hat{H} = -i\hbar\nabla$ b) $\hat{H} = i\hbar\frac{\partial}{\partial t}$
c) $\hat{H} = \frac{\hbar^2}{2m}\nabla^2 - v(r)$ d) $\hat{H} = -\frac{\hbar^2}{2m}\nabla^2 + v(r)$
- v) To obtain the observed doublet fine structure of spectral lines the concept introduced is of _____
a) Spin motion of electron b) Orbital motion of electron
c) Magnetic field produced at the electron d) Space quantization



vi) The z component of angular momentum operator is given by $L_z =$

- a) $i\hbar \frac{\partial}{\partial \phi}$ b) $i\hbar \frac{\partial}{\partial \theta}$
 c) $-i\hbar \frac{\partial}{\partial \phi}$ d) $m\hbar$

vii) Pure rotational spectra occur in _____

- a) Ultraviolet region b) Microwave region
 c) Infrared region d) Visible region

viii) Which of the following relation satisfies the Einstein's frequency relation is _____

- a) $E = h\nu$ b) $E \neq h\nu$
 c) $E \neq \hbar \omega$ d) $E = \hbar \omega$

ix) Raman shift for antistoke's lines is _____

- a) Negative b) Positive
 c) Zero d) Fraction

x) If $e^{\alpha y}$ is eigen function and $\frac{d^2}{dy^2}$ is operator then eigen value of operator is _____

- a) α b) α^3
 c) α^2 d) αy

2. Answer **any five** of the following :

10

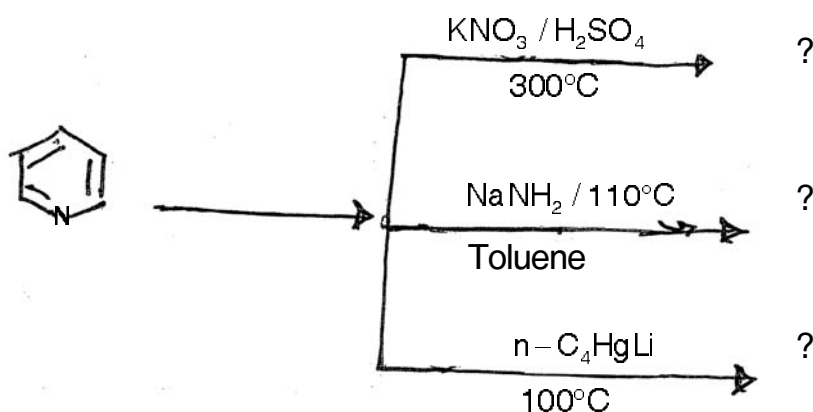
- i) What is an operator ?
- ii) What are molecular bonds ?
- iii) State selection rule for doublets.
- iv) Draw the diagram for potential barrier and state its boundary conditions.
- v) State the series of optical spectra in Lithium atom.
- vi) Write any two characteristic properties of Raman lines.



3. A) Attempt **any two** of the following : 6
- i) Obtain the eigen value of L_z .
 - ii) Discuss eigen functions of linear harmonic oscillator.
 - iii) Write note on weak field stark effect in hydrogen.
- B) Discuss both qualitative and quantitative intensity rules used to calculate relative intensity of spectral lines in a doublet. 4
4. Answer **any two** of the following : 10
- i) Write a note on frank condon principle.
 - ii) Explain zero point energy of harmonic oscillator.
 - iii) By separation of variables in spherical polar co-ordinates $\psi (r, \theta, \phi) = R(r)\theta(\theta)\phi(\phi)$ derive three separate equations for R , θ and ϕ from Schrodingers equation for hydrogen atom.
5. Answer **any one** of the following : 10
- i) What is Paschen back effect ? Obtain an expression for term value, explain Paschen back effect in principle series doublet with energy level diagram.
 - ii) Derive Schrodinger's time dependent wave equation for matter wave in one and three dimensions.
-



3. A) Attempt **any two** of the following : 6
i) Predict the products of following reactions



- ii) How will you convert fructose into glucose ?
iii) Give synthesis and uses of Isoniazid.
- B) Discuss the applications of Vat dyes and Mordant dyes. 4
4. Attempt **any two** of the following : 10
i) Discuss Skraup's synthesis of quinoline.
ii) Discuss the configuration of D-glucose from D-arabinose
iii) Give synthesis and uses of monocrotophos.
5. Attempt **any two** of the following : 10
i) Discuss structure of vitamin-A on the basis of analytical ground.
ii) Give synthesis and uses of chloromycetin.
iii) Discuss the methylation method for determination of ring size of D-glucose.
-



Seat No.	
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B.Sc. (Part – III) (Semester – VI) (Old) Examination, 2017
ZOOLOGY (Special Paper – XV)
Molecular Biology and Biotechnology

Time : 2 Hours

Total Marks : 50

- Instructions :** i) **All questions are compulsory.**
ii) **Figures to the right indicate full marks.**
iii) **Draw neat labeled diagrams wherever necessary.**

1. Select the appropriate answer from each of the following and rewrite the sentence : **10**
- 1) Enzymes that catalyzes RNA directed DNA synthesis are known as
 - a) RNA Polymerase
 - b) DNA Polymerase
 - c) Reverse transcriptase
 - d) RNA-DNA Polymerase
 - 2) Removal of Introns from eukaryotic m-RNA is known as
 - a) Capping
 - b) Methylation
 - c) Adenylation
 - d) Splicing
 - 3) Okazaki fragments are formed during
 - a) Transcription
 - b) Translation
 - c) Replication
 - d) Reverse Transcription
 - 4) _____ are small, circular, extra-chromosomal genetic materials in prokaryotes.
 - a) Cosmids
 - b) Plasmids
 - c) Yeast Artificial Chromosomes
 - d) Phagemids
 - 5) _____ enzyme seals breaks in DNA.
 - a) DNA Methylase
 - b) DNA Gyrase
 - c) DNA topoisomerase
 - d) DNA Ligase
 - 6) _____ polymerase is used in PCR technique.
 - a) Taq
 - b) Paq
 - c) Baq
 - d) Caq
 - 7) _____ are used in detection of unknown target molecules such as DNA and RNA.
 - a) Probes
 - b) Vectors
 - c) Introns
 - d) Monoclonal antibodies

P.T.O.



Seat No.	
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B.Sc. – III (Semester – VI) (Old) Examination, 2017
MATHEMATICS (Special Paper – XV)
Integral Transform

Time : 2 Hours

Max. Marks : 50

N.B. : 1) **All questions are compulsory.**
2) Figures to the **right** indicates **full marks.**

1. Select the correct alternative :

10

1) $L\{\sin at\} = \underline{\hspace{2cm}}$

- a) $\frac{p}{p^2 - a^2}$ b) $\frac{a}{p^2 - a^2}$ c) $\frac{p}{p^2 + a^2}$ d) None of these

2) $L\{f(t)\} = f(p)$ then $L\{e^{-at}f(t)\} = \underline{\hspace{2cm}}$

- a) $af(p)$ b) $f(p + a)$ c) $f(p - a)$ d) None of these

3) $L\{t^2e^{2t}\}$

- a) $\frac{1}{p^3}$ b) $\frac{6}{p^3}$ c) $\frac{2}{(p-2)^3}$ d) None of these

4) If $L\{f(t)\} = f(p)$ then initial value theorem states that $\underline{\hspace{2cm}}$

- a) $\lim_{t \rightarrow 0} f(t) = \lim_{p \rightarrow \infty} pL\{f(t)\}$ b) $\lim_{t \rightarrow \infty} f(t) = \lim_{p \rightarrow 0} pL\{f(t)\}$
c) $\lim_{t \rightarrow 0} f(t) = \lim_{p \rightarrow 0} pf(p)$ d) None of these

5) $L^{-1}\left\{\frac{p}{p^2 + a^2}\right\} = \underline{\hspace{2cm}}$

- a) $\frac{\sin at}{a}$ b) $\frac{\cos at}{a}$ c) $\cos at$ d) None of these



6) $L^{-1}\left\{\frac{2}{p^2 - 2}\right\} = \underline{\hspace{2cm}}$

a) $\sin \sqrt{2} t$

b) $\sqrt{2} \sin h \sqrt{2} t$

c) $\sqrt{2} \cos h \sqrt{2} t$

d) none of these

7) Convolution of two function is always

a) Commutative

b) Associative

c) Both a) and b)

d) None of these

8) $1 * 1 * 1 = \underline{\hspace{2cm}}$

a) $\frac{t^h}{n!}$

b) $\frac{t^3}{3!}$

c) $\frac{t^2}{2!}$

d) None of these

9) $L\{f''(t)\} = \underline{\hspace{2cm}}$

a) $pL\{f(t)\} - pF'(0) - F(0)$

b) $p^2L\{f(t)\} - pF'(0) - F(0)$

c) $p^2L\{f(t)\} - pL\{f(t)\}$

d) None of these

10) $\int_0^{\infty} \frac{\sin t}{t} dt = \underline{\hspace{2cm}}$

a) $\frac{\pi}{2}$

b) $\frac{\pi}{4}$

c) $\frac{\pi}{3}$

d) None of these

2. Attempt **any five** of the following :

10

1) Find $L\{\sin at\}$.

2) Find $L\{(\sin t - \cos t)^2\}$.

3) Find $L\{e^{-3t} (3 \cos 5t - 5 \sin 6t)\}$.

4) Find $L^{-1}\left\{\frac{1}{p^{5/2}}\right\}$.

5) Find $L^{-1}\left\{\frac{1}{p^2 + 8p + 16}\right\}$.

6) Evaluate $L^{-1}\left\{\frac{e^{-3P}}{(p-2)^4}\right\}$.



3. A) Attempt **any two** of the following : 6

1) Solve $(D^2 - 2D + 2)y = 0$ $y = Dy = 1$ when $t = 0$.

2) Find $L\{f(t)\}$ where

$$f(t) = \begin{cases} 0 & 0 < t < 1 \\ t & 1 < t < 2 \\ 0 & t > 2 \end{cases}$$

3) Solve $L^{-1}\left\{\frac{3p-7}{p^2-2p-3}\right\}$.

B) If $L\{f(t)\} = f(p)$ then prove that $L\{f(at)\} = \frac{1}{a}f\left(\frac{p}{a}\right)$. 4

4. Attempt **any two** of the following : 10

1) Find $L^{-1}\left\{\log\left(1 - \frac{1}{p^2}\right)\right\}$.

2) Prove that $L\{af_1(t) + bf_2(t)\} = aL\{f_1(t)\} + bL\{f_2(t)\}$ and hence solve $L\{3 \cos 6t - 5 \sin 3t\}$.

3) Solve $(D + 2)^2 = 4e^{-2t}$ when $y(0) = -1$, $y'(0) = 4$.

5. Attempt **any one** of the following : 10

1) State and prove convolution theorem and solve by applying the convolution theorem

$$L^{-1}\left\{\frac{1}{(p+1)(p-2)}\right\}$$

2) a) Let $F(t)$ be periodic function with period $T > 0$ that is $F(u + T) = F(u)$,

$$F(u + 2T) = F(u) \text{ etc. Prove that } L\{f(t)\} = \int_0^T \frac{e^{-pt} F(t) dt}{1 - e^{-pT}}$$

b) Find Laplace transform of $f(t)$ if $f(t) = \begin{cases} \sin(t - \pi/3) & t > \pi/3 \\ 0 & t < \pi/3 \end{cases}$



v) If $\{X_n\}, \{Y_n\}$ be two sequences of random variables (r.vs) with $X_n \xrightarrow{\text{Law}} x$ and $Y_n \xrightarrow{\text{Law}} a$ where X is a r.v. and a is a constant, then

- a) $(X_n + Y_n) \xrightarrow{\text{Law}} x + a$ b) $(X_n + Y_n) \xrightarrow{\text{Law}} x + y$
 c) $(X_n + Y_n) \xrightarrow{\text{Law}} x$ d) $(X_n + Y_n) \xrightarrow{\text{Law}} a$

vi) Reliability of a series system of three components is

- a) $(1 - P_1)(1 - P_2)(1 - P_3)$ b) $P_1 + P_2 + P_3$
 c) $P_1 P_2 P_3$ d) $1 - P_1 P_2 P_3$

vii) In usual notations hazard rate is given by

- a) $\frac{f(t)}{1 - F(T)}$ b) $\frac{f(t)}{F(T)}$ c) $\frac{1 - f(t)}{F(T)}$ d) $\frac{1 - f(t)}{1 - F(T)}$

viii) Probability of survival of any component at time t will be _____ as $t \rightarrow \infty$.

- a) 0.5 b) 0 c) 1 d) None of these

ix) In $M/M/1 : \infty/\text{FIFO}$ model, the distribution of service time is

- a) Poisson b) Geometric c) Exponential d) Binomial

x) In $M/M/1 : \infty/\text{FIFO}$ model the probability that the server is busy is

- a) $\frac{\lambda}{\mu}$ b) $1 - \frac{\lambda}{\mu}$ c) $\frac{\mu}{\lambda}$ d) $1 - \frac{\mu}{\lambda}$

2. Attempt **any five** from the following :

10

- a) In $M/M/1 : \infty/\text{FIFO}$ model, if on an average one customer arrives every five minutes and service time is 4 minutes per customer, find traffic intensity.
 b) In usual notations write down the CDF of n^{th} order statistic.
 c) A coin with $P(H) = 0.4$ is tossed 50 times. Then find the lower bound for $P(10 < X < 30)$.
 d) State the relationship between density function and hazard function.
 e) For a parallel system of three components say A, B, C obtain all minimal cut sets and minimal path sets.
 f) Let X_1, X_2, \dots, X_n be a random sample from $\chi^2_{(10)}$ distribution. Test whether W.L.L.N. holds good.



3. A) Attempt **any two** from the following : **6**
- i) Suppose X_i are iid $P(0.02)$ r.vs. $i = 1, 2, \dots, 100$. Then using CLT obtain approximately $P\left[\sum X_i \geq 5\right]$.
 - ii) Show that hazard rate of a series system of independent components is sum of hazard rates of these components.
 - iii) State the assumptions made for obtaining the distribution of departure in queuing system.
- B) Define convergence in probability of a sequence of r.vs. to a constant.
- If $X_n \xrightarrow{P} a$ as $n \rightarrow \infty$ and $Y_n \xrightarrow{P} b$ as $n \rightarrow \infty$ then discuss the convergence in probability of $2X_n + 4Y_n$. **4**
4. Attempt **any two** from the following : **10**
- A) State and prove Weak Law of Large Numbers for iid r.vs.
 - B) How large a sample must be taken from $N(\mu, 1)$ distribution so that $P\left[|\bar{X}_n - \mu| < 0.5\right] \geq 0.96$. What is the actual probability using this sample size ?
 - C) Customers arrive at a box office window being served by a single person according to Poisson input process with mean rate 60 per hour. The time required to serve a customer has an exponential distribution with mean of 40 seconds. Determine (i) traffic intensity ρ (ii) average number of customers in the queue L_q (iii) Average number of customers in the system L_s (iv) W_s (v) W_q .
5. Attempt **any one** from the following : **10**
- A) Find the distribution of Y_r when a random sample of size n is taken from $\exp(\theta)$ distribution. Further show that $U = Y_r$ and $V = Y_s - Y_r$ $r < s$; are independently distributed. Hence show that $Z = Y_{(r+1)} - Y_r$ is exponential r.v. with parameter $(n - r)\theta$.
 - B) Let X be $B(n, p)$ r.v. Let Y be standard binomial r.v. defined on X . Show that limiting distribution of Y is $N(0, 1)$. Hence show that sequence of standard binomial distributions converges in distribution to standard normal distribution.
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Seat No.	
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B.Sc. (Part – III) (Semester – VI) (Old) Examination, 2017
COMPUTER SCIENCE
Operating System – II (Special Paper – XV)

Time : 2 Hours

Total Marks : 50

Instructions: 1) *All questions are compulsory.*
2) *Figures to the right indicate full marks.*

1. Choose the correct alternatives :

10

- 1) In Linux file system _____ is the top level directory.
a) boot b) home c) root d) bin
- 2) In shell programming user must be declare variables before they are apply.
a) True b) False
- 3) _____ command is used to extract a column from a text file.
a) tar b) cut c) get d) read
- 4) PWD stands for
a) Print Working Directory b) Personal Work Directories
c) Pass Work Directories d) Present Work Dictionary
- 5) In rm command _____ option is used to remove file interactively.
a) – k b) – d c) – j d) – i
- 6) _____ command is used to display first few lines of a file.
a) head b) uniq c) tail d) display
- 7) Which command is used to display and create files ?
a) cd b) vi c) cat d) create
- 8) Which command is used to print a file ?
a) pq b) prn c) lpr d) print
- 9) NIS stands for Network Information System.
a) True b) False
- 10) Find command can search for files by
a) date b) size c) name d) all of these

P.T.O.



2. Solve **any 5** from the following **10**
- 1) What is file command ?
 - 2) List out features of Linux.
 - 3) Explain LILO.
 - 4) What is user account ?
 - 5) Write syntax and example of ln command.
 - 6) What is kill command ?
3. A) Attempt **any two** : **6**
- 1) What is redirection ? Explain I/O redirection.
 - 2) What is file ? Explain types of file.
 - 3) Explain ls command with option and example.
- B) Write a shell script to check given number is palindrome or not. **4**
4. Attempt **any two** : **10**
- 1) Explain chmod command with all permissions and example.
 - 2) Explain filter commands.
 - 3) Write a note on pppd and ezppp.
5. Attempt **any two** : **10**
- 1) Explain tar command with example.
 - 2) What is shell ? Explain types of shell.
 - 3) Explain modes of vi editor.
-



Seat No.	
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B.Sc. (Part – III) (Semester – VI) (Old) Examination, 2017
PHYSICS (Special Paper – XVI)
Electronics and Instrumentation

Time : 2 Hours

Max. Marks : 50

- Instructions :** 1) **All questions are compulsory.**
2) **Figures to the right indicate full marks.**
3) **Use of calculator or log table is allowed.**
4) **Neat diagrams must be drawn wherever necessary.**

1. Select the correct alternative from the following : 10
- i) _____ is the ratio of change in input offset current to the change in temperature.
- Input offset current drift
 - Input offset voltage drift
 - Slew rate
 - Common mode input impedance
- ii) The non-inverting Op-amp output is _____
- Constant
 - In phase with input
 - Out of phase with input
 - Reverse
- iii) In an IC-555 in astable mode, period of the output waveform is given by _____.
- $1.1 R_A C$
 - $0.693 R_A C$
 - $0.693 (R_A + 2R_B)C$
 - $1.44/(R_A + R_B)C$
- iv) The pulse-width in a 555 monostable multivibrator is given by
- $0.69 RC$
 - $1.1 RC$
 - RC
 - None of these



- v) A Triac is a _____ terminal device.
a) Four b) Three c) Two d) None of these
- vi) Holding current, in a p-n-p-n diode, is the
a) Normal operating current
b) Current corresponding to break over voltage
c) Minimum current to keep the device ON
d) None of these
- vii) LCD's are _____ displays characterised by very low power consumption.
a) Active b) Passive
c) Both active and passive d) None of above
- viii) A device which converts a current signal into proportional voltage signal is called as _____
a) Amplifier b) Transducer
c) Rectifier d) Filter
- ix) The metal mostly used in RTD is _____
a) Copper b) Iron c) Platinum d) Silver
- x) In a scanning electron microscope, the electron beam can be focussed to a very small spot size using _____
a) Electrostatic and magnetostatic lenses
b) Optical lenses
c) Diffraction lenses
d) None of the above

2. Answer **any five** of the following :

10

- i) Draw the block diagram of operational amplifier.
- ii) State the applications of IC 555.
- iii) Give any two method of SCR firing.
- iv) Give the important features of liquid crystal displays.
- v) What is principle of resistance temperature transducer.
- vi) State any two applications of SEM.



3. A) Answer **any two** of the following : **6**
- i) Explain Op. Amp as an inverting amplifier.
 - ii) Write note on gas discharge plasma display.
 - iii) What are the different characteristics of transducer ?
- B) Calculate the period of output waveform produced by astable multivibrator when charging resistance R_A is $10\text{ K}\Omega$ and R_B is $10\text{ K}\Omega$ with capacitance of $0.1\ \mu\text{F}$. **4**
4. Answer **any two** of the following : **10**
- i) Give an account of construction and working of Triac.
 - ii) Explain principle and working of photo diode transducer.
 - iii) Write note on light emitting diode display.
5. Answer **any one** of the following : **10**
- i) With neat circuit diagram, explain operational amplifier as differentiator and integrator.
 - ii) Describe principle, construction and working of transmission electron microscopy.
-



- vii) A vulcanizing agent assist _____ of polymer chain.
a) cross-linking b) branching c) debranching d) softening
- viii) Graining, waiting and shock treatment are used for _____ sugar.
a) dissolving b) crystallizing
c) refining d) purifying
- ix) Chemical products should be designed to preserve the efficacy of function while reducing _____.
a) yield b) utility c) toxicity d) all of these
- x) Bleaching of cotton by sodium hypochlorite involves _____ process.
a) oxidation b) reduction c) hydrolysis d) decomposition

2. Answer **any five** of the following. 10
- What is chromatography ? Mention different types of chromatographies.
 - What are zeolites ? Give two examples of zeolites.
 - Explain defecation process in the refining of sugar.
 - Explain meaning of LDPE and HDPE with suitable example.
 - Explain finishing process in the manufacture of soap.
 - Write a brief note on reactive dyes.
3. A) Attempt **any two** of the following : 6
- Define elastomers, thermoplastics and thermosetting polymers. Give one example of each.
 - Explain use of zeolites in Friedel-Craft's alkylation with suitable examples.
 - Explain general principles involved in the chromatographic separations.
- B) Explain free radical (addition) polymerization using suitable example. 4
4. Answer **any two** of the following : 10
- What are biocatalysts ? Give advantages of biocatalysts.
 - Discuss principle and experimental technique of paper chromatography.
 - Describe sizing ingredients with their functions.
5. Answer **any two** of the following : 10
- Compare soaps verses detergents.
 - Give preparation and uses of PVC and urea formaldehyde resin.
 - Write note on 'By products of sugar industry'.
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Seat No.	
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**B.Sc. (Part – III) (Semester – VI) (Old) Examination, 2017
ZOOLOGY (Special Paper – XVI)
Biotechniques and Applied Zoology**

Time : 2 Hours

Max. Marks : 50

- Instructions:** 1) *All questions are compulsory.*
2) *Figures to the **right** indicate **full** marks.*
3) *Draw **neat** and labeled diagrams **wherever** necessary.*

1. Select appropriate answer from **each** of the following and rewrite the sentence. **10**
- 1) The full form of PAGE is _____
 - a) Polyanamide Gel Electrophoresis
 - b) Polyamide Gel Electrophoresis
 - c) Polyacrylamide Gel Electrophoresis
 - d) Polyanalide Gel Electrophoresis
 - 2) Tribolium is the pest of _____ crop.
 - a) Cotton
 - b) Jowar
 - c) Pea
 - d) Maize
 - 3) _____ is a good source of fish oil.
 - a) Catla
 - b) Mrigal
 - c) Pompret
 - d) Oil Sardine
 - 4) Silk is a secretion of silkworm from its specialized _____.
 - a) Salivary glands
 - b) Spiracles
 - c) Fat bodies
 - d) Malpighian tubules
 - 5) In pearl culture _____ are cultivated for pearl.
 - a) Bivalves
 - b) Snails
 - c) Oysters
 - d) Mytilus
 - 6) Isinglass is prepared from _____ of fishes.
 - a) Fins
 - b) Airbladders
 - c) Skin
 - d) Urinarybladder
 - 7) The very young fishes coming out of eggs are called _____.
 - a) Fingerlings
 - b) Fry
 - c) Milt
 - d) Younglets
 - 8) The pH of given sample is measured by the device _____.
 - a) Balance
 - b) pH meter
 - c) Colorimeter
 - d) Spectrometer



Seat No.	
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B.Sc. – III (Semester – VI) (Old) Examination, 2017
MATHEMATICS (Special Paper – XVI)
Programming in C

Time : 2 Hours

Max. Marks : 50

Instructions: 1) *All questions are compulsory.*
2) *Figures to the right indicate full marks.*

1. Select the correct alternative for **each** of the following : **10**
- 1) C does not have an operator for
 - a) modulo division
 - b) is not equal to
 - c) exponential
 - d) decrement
 - 2) White spaces are prohibited between the
 - a) Characters of the identifiers
 - b) Characters of the string constants
 - c) Control string of the scanf
 - d) Control string of the printf
 - 3) The return statement can take the form
 - a) return ; only
 - b) return (expression); only
 - c) return; or return (expression);
 - d) none of these
 - 4) The number of evaluation steps in arithmetic expressions are not equal to the number of arithmetic operators if arithmetic expression has
 - a) no parentheses
 - b) parenthesis but not nested
 - c) nested parentheses
 - d) none of these
 - 5) ANSIC allows nesting of for loops upto _____ level of nesting.
 - a) 14
 - b) 15
 - c) 16
 - d) 17



- 6) The white space form feed moves cursor to
- After one blank space of the current line
 - Beginning of the current line
 - Initial position of the next page
 - Initial position of the current page
- 7) Documentation section in C program is _____ part.
- Optional
 - Compulsory
 - Necessary
 - None of these
- 8) The operator _____ is used with real operands.
- modulo division
 - logical bitwise
 - division
 - shift
- 9) _____ is not used for reading a data.
- putchar()
 - scanf()
 - assignment operator =
 - none of these
- 10) It is necessary to put semi-colon at the end of the _____ statement.
- do
 - do . . . while
 - for
 - none of these

2. Answer **any five** of the following :

10

- Write a note on reading a character.
- Explain simple if statement.
- Write note on basic structure of the C-programs.
- Compare for, while and do loops.
- Define comma operator and size of operator.
- Explain local variable and global variable.

3. A) Answer **any two** of the following :

6

- Define entry-controlled loop and exit-controlled loop with diagrammatically illustration.
- Write note on increment and decrement operator with illustration.
- Explain nesting of if . . . else statement in detail.



B) The grading of the students follows the following rule.

4

Average Marks	Grade
80 to 100	Distinction
60 to 79	First class
50 to 59	Second class
40 to 49	Pass class
0 to 39	Fails

Write C-program by using else if ladder to display the roll number, name, marks obtained and grade acquired.

4. Attempt **any two** of the following :

10

- 1) Define one dimensional array and explain the procedure how to declare and initialise it.
- 2) Explain the for statement with illustration.
- 3) Explain the precedence of the arithmetic operators with rules and examples.

5. Attempt **any one** of the following :

10

- 1) Explain the term formatted outputs in details with the illustrations.
 - 2) Explain data type in details.
-