Seat No.	

Physics (Applied Electronics) (Semester – I)
(New) (CBCS) Examination, 2017
MATHEMATICAL TECHNIQUES

Day & Date: Tuesday, 18-04-2017 Max. Marks: 70

Time: 10.30 AM to 01.00 PM

N.B. : *1) Q. No. **1** and Q. No. **2** are **compulsory**.*
*2) Answers any **three** questions from Q. No. **3** to **7.***
3) Use of Non-programmable calculator is allowed.
4) All questions carry equal marks.

Q.1 a) Choose the correct option: **06**

1) For a given two complex numbers Z_1 and Z_2; $|Z_1 + Z_2| =$ _
   a) $> |Z_1| + |Z_2|$ b) $\leq |Z_1| + |Z_2|$
   c) $\leq (Z_1 + Z_2)$ d) $> (Z_1 + Z_2)$

2) Let Z_1 and Z_2 be two complex numbers such that $Z_1 \neq Z_2$ and $|Z_1| = |Z_2|$. If Z_1 has positive real part and Z_2 has negative imaginary part, then $\frac{(z_1+z_2)}{(z_1-z_2)}$ may be ____.
   a) Zero; b) Real and positive
   c) Real and negative d) None of these

3) The Cauchy- Riemann equation in polar form is _____.
   a) $\frac{\partial u}{\partial r} = \frac{\partial v}{\partial \theta}$ and $\frac{\partial u}{\partial \theta} = \frac{\partial v}{\partial r}$ b) $\frac{\partial u}{\partial r} = r\frac{\partial v}{\partial \theta}$ and $\frac{\partial u}{\partial \theta} = -\frac{\partial v}{\partial r}$
   c) $\frac{\partial u}{\partial r} = \frac{1}{r}\frac{\partial v}{\partial \theta}$ and $\frac{1}{r}\frac{\partial u}{\partial \theta} = -\frac{\partial v}{\partial r}$ d) $\frac{\partial u}{\partial r} = \frac{\partial v}{\partial \theta}$ and $\frac{1}{r}\frac{\partial u}{\partial \theta} = -\frac{\partial v}{\partial r}$

4) The eignvalues of the matrix, $A = \begin{pmatrix} 1 & 0 & 0 \\ 0 & 1 & 1 \\ 0 & 1 & 1 \end{pmatrix}$ are_____.
   a) 1,1, 2; b) 0,1, 2; c) 2, 2, 0; d) 2, 2,1

5) The independent solutions of the differential equation; $\frac{d^2y}{dx^2} - 3\frac{dy}{dx} + 2y = 0$ are _____.
   a) e^{2x} and e^{-x}; b) e^{2x} and e^{x};
   c) $\frac{1}{x}$ and x^2; d) $\sin(2x)$ and $\cos(x)$

6) The value of $\int_{-\Pi}^{\Pi} \sin(3x)\cos(3x)\,dx =$_____.
   a) Π; b) $\frac{\Pi}{2}$; c) $-\frac{\Pi}{2}$; d) 0

Q.2 b) State True or False: **08**

1) The number $|Z|$ is the distance between the point (x, y) and the origin.
2) A set of vectors $\{u_i\}$ is said to be linearly independent if there exists a corresponding set of scalars $\{\alpha_i\}$, not all zero.

3) The commutative law of multiplication is valid (ingeneral) for the matrix product, AB and BA.
4) A differential equation, $\frac{dy}{dx} + p(x)y = q(x)y^n \ \ (n \neq 1)$ is a linear differential equation.
5) Any single-valued function, $f(x)$, defined on the interval $[-\Pi, \Pi]$ may be represented over this interval by the Fourier series.
6) The convolution of two functions, $f(t)$ and $g(t)$ is commutative.
7) The Laplace transform of $f(t) = 1$ is $\frac{1}{s}$, with $s < o$.
8) The linearity property of Fourier transform is;

$$\mathrm{F}[\propto \mathrm{x(t)} + \beta \mathrm{y(t)}] = \mathrm{t\ F\ [x(\propto)]} + \ \mathrm{t\ F\ [y(\propto)]}$$

Q.2 Answer the following:

a) Classify the singularities and calculate the residue for $f(z) = \frac{1}{(z^2+a^2)^2}$, (where $a > o$). **05**

b) From the fourier series for $f(t) = t.sint, [-\Pi, \Pi]$; show that $\frac{1}{2} + \frac{1}{3} - \frac{1}{15} + \frac{1}{35} - \ \ldots\ldots = \frac{\Pi}{4}$. **04**

c) Obtained the Fourier transform for $f(x) = N.e^{-\propto x^2}$; N and $\propto$ constants. (i) Find its Fourier transform, $g(\omega)$; then plot the graph of $f(x)$ and $g(\omega)$ for large $\propto$ and small $\propto$. **05**

Q.3 a) Using the complex variable technique, evaluate the integral **08**

$$\int_o^{2\Pi} \frac{sin^2\theta}{5 - 4\cos\theta}\, d\theta$$

b) Find the eigenvalues and eigenvectors of the matrix, **06**

$$A = \begin{pmatrix} 3 & -2 & 0 \\ -2 & 3 & 0 \\ 0 & 0 & 5 \end{pmatrix}$$

Q.4 a) Solve $\frac{d^2y}{dx^2} - 2\frac{dy}{dx} + y = 2\cos x$ **08**

b) Expand $f(x), o < x < 2$ in a half- range cosine fourier series. **06**

Q.5 a) Using the partial fraction expansions, show that the inverse laplace transforms, $L^{-1}\left\{\frac{s}{(s+a)(s+b)}\right\} = \frac{ae^{-at} - be^{-bt}}{a-b}\ (a \neq b)$. **08**

And $L^{-1}\left\{\frac{s}{(s^2+a^2)(s^2+b^2)}\right\} = -\frac{1}{a^2-b^2}\left(\frac{\sin at}{a} - \frac{\sin bt}{b}\right)\ (a^2 \neq b^2)$

b) Show that all the eigenvalues of a unitary matrix have unit magnitude. **06**

Q.6 a) The function, $f(x) = \begin{cases} 1, & |x| < 1 \\ 0, & |x| > 1 \end{cases}$ is a symmetrical finite step function. **08**

i) Find the $g_c(\omega)$, fourier cosine transform of $f(x)$.

ii) From the answer (i), show that $f(x) = \frac{2}{\Pi}\int_o^\infty \frac{sin\omega\ cos\omega\ x}{\omega}\, d\omega$

b) Verify the Cauchy-Riemann equations for the functions u, v given by; $(x, y) = x^3 - 3xy^2$; $v(x, y) = \ 3x^2y - y^3$. **06**

Q.7 **a)** Find the Fourier series that represents the functions defined by $f(t) = \begin{cases} 0 & -\Pi < t < o \\ \sin t & o < t < \Pi \end{cases}$ **08**

b) Find the Fourier transform of triangular pulse defined by **06**

$$f(x) = \begin{cases} h(1 - a|x|), & |x| < 1/a \\ 0 \quad , & |x| > 1/a \end{cases}$$

SLR-RO – 699

Seat No.	

M.Sc. Physics (Applied Electronics) (Semester – I) (New) (CBCS) Examination, 2017
CONDENSED MATTER PHYSICS

Day & Date: Saturday, 20-04-2017 Max. Marks: 70

Time: 10.30 AM to 01.00 PM

Instructions: *1) Attempt **five** questions.*
*2) Q (**1) and Q. (2) are compulsory.***
*3) Attempt **any three** from **Q.3** to **Q.7**.*
*4) Figures to the **right** indicate **full** marks.*
*5) **Use** of non scientific calculator **allowed**.*

Q.1 A) Select correct alternative. **08**

1) Density of a crystal remains unchanged as a result of.
   a) Vacancy defect b) Interstitial defect
   c) Frankel defect d) Schottky defect

2) Which one of the following compound exhibits both Schottky and Frenkel Defects?
   a) NaCl b) AgCl c) AgBr d) AgI

3) For a closed packed BCC structure of hard spheres, the lattice constant a is related to the sphere radius R is
   a) $a=4R/\sqrt{3}$ b) $a=4R/\sqrt{3}$ c) $a=4R/\sqrt{2}$ d) $a=4R/\sqrt{2}$

4) At lower temperature the lattice specific heat varies as.
   a) T^3 b) $1/T^3$ c) T d) 1/T

5) Ice (H_2O) is an example of.
   a) Triclinic system b) Hexagonal system
   c) Orthorhombic system d) Monoclinic system

6) The susceptibility of a superconductor is.
   a) Positive and small b) Positive and unity
   c) Negative and small d) Negative and unity

7) Superconducting electron density is.
   a) Finite at absolute zero
   b) Zero at absolute zero
   c) Infinite at absolute zero
   d) Non-zero finite at critical temperature

8) BCS theory assume a
   a) Spherical FS and isotropic energy gap
   b) Spherical FS and anisotropic energy gap
   c) Non spherical FS and isotropic energy gap
   d) Non spherical FS and anisotropic energy gap

B) State Truth of False: **06**

1) Ionic bonding for a crystal with alternate and evenly spaced positive and negative ions is.
   a) True b) False

2) Germanium is a covalently bonded crystal.
   a) True b) False

3) An SC lattice is reciprocal lattice to an FCC lattice.
   a) True b) False

4) The form of the graph between energy E and wave vector k for an electron in periodic lattice is parabolic.
   a) True b) False

5) The form of the graph between energy E and wave vector k for an electron in periodic lattice is parabolic.
   a) True b) False

6) The conventional superconductor is paramagnetic below T_c
   a) True b) False

Q.2 Attempt following: **14**

1) Orientation polarization **05**
2) Complex dielectric constant **05**
3) Heat capacity **04**

Q.3 A) Explain with E-K diagram periodic zone scheme, Extended zone scheme and reduced zone. **10**

B) Differentiate polycrystalline, nanocrystalline and amorphous materials. **04**

Q.4 A) What is brillouin zones? Construct the Fermi surfaces in brillouin zones for two-dimensional lattices. **10**

B) Explain the indirect band gap semiconductors. **04**

Q.5 A) What is dielectric polarization? Give the expression for electronic polarizabiliy. **10**

B) Introduced the methods for calculations of energy bands and their features. **04**

Q.6 A) Explain the dielectric relaxation in alternating fields. **06**

B) What is Meissner effect? Derive relation for penetration depth. **06**

Q.7 A) What is superconductor? Discuss London theory in detail. **10**

B) Difference between type I and II superconductors. **04**

SLR-RO - 700

Seat No.	

M.Sc. (Physics-Applied Electronics) (Semester – I) (New) (CBCS) Examination, 2017
ANALOG & DIGITAL ELECTRONICS

Day & Date: Saturday, 22-04-2017 Max. Marks: 70

Time: 10.30 AM to 01.00 PM

N.B. : *1) Q.**(1)** & Q. **(2)** are **compulsory**.*
*2) Answer **any three** questions from Q.**3** to Q.**7**.*
*3) All questions carry **equal** marks.*

Q.1 Objectives questions. **14**

A) Select correct alternatives. **08**

1) The output stage of an op-amp usually a
   a) Complementary emitter follower.
   b) Transformer coupled class B amplifier.
   c) Class A power amplifier.
   d) Class B amplifier.

2) The 'slew rate' of an operational amplifier indicates
   a) How fast its output current can change
   b) How fast its output impedance can change
   c) How fast its output power can change
   d) How fast its output voltage can change

3) A phase shift oscillator uses_____.
   a) LC tuning
   b) Piezoelectric crystal
   c) Balanced bridge
   d) Variable frequency operation

4) The three variable Boolean expression $xy + xyz + \bar{x}y + x\bar{y}z$
   a) $\bar{y} + x\bar{z}$ b) $\bar{x} + \bar{y}z$ c) $y + xz$ d) $y + \bar{x}z$

5) It is required to construct to count upto 100(decimal). The minimum number of flipflops to construct the counter is
   a) 8 b) 7 c) 6 d) 5

6) 8085 microprocessor carryout the subtraction by
   a) ABCD subtraction method
   b) Hexadecimal subtraction method
   c) 2's complement method
   d) Floating point subtraction method

B) Select correct alternatives. **08**

1) An Op-amp as a voltage follower has a voltage gain of Unity. (True/False)
2) For generating 1 kHz signal, the most suitable circuit is Wien bridge oscillator. (True/False)
3) A one-to-sixteen demultiplexer requires 4 select input lines. (True/False)
4) An instruction cycle is made up of machine cycles and a machine cycle is made up of number of states. (True/False)
5) Current through a virtual ground is _____.
6) A phase shift oscillator uses_____.
7) A one-to-sixteen demultiplexer requires _____select input lines.
8) A _____development system and an _____are essential tools for writing large assembly language programs.

Q.2 Write short notes. **14**

a) Discuss the terminal properties of an ideal operational amplifier. **05**
b) Explain how an S-R flip-flop can be converted into a J-K-flip-flop. **05**
c) Write briefly on instrumentation amplifier. **04**

Q.3 A) Draw the block schematic of a typical operational amplifier and briefly explain the function of each block. Also give the equivalent circuit of the op-amp. **08**

B) With a neat circuit diagram derive an equation for the closed loop gain of an operational amplifier. **06**

Q.4 A) Draw the circuit of Practical Differentiator and derive expression for its output voltage. **08**

B) Define the following for an OPAMP **06**

1) Input bias current
2) Input offset voltage

Briefly describe how the input offset voltage can be measured.

Q.5 A) What is meant by a voltage regulator? Draw the block diagram of a regulated power supply and explain the function of its various components. **08**

B) Realize a non-inverting summer using OPAMP. **06**

Q.6 A) What is a decoder? Draw the logic circuit of a 3 line to 8 line decoder and explain its working. **08**

B) With relevant diagram explain the working of master-slave JK Flip-Flop. **06**

Q.7 A) Draw the internal architecture of 8085 and explain various functional blocks. **08**

B) Write a program to find the largest number in an array of data using 8085 instruction set. **06**

Seat No.	

M.Sc. (Physics-Applied Electronics) (Semester – I) (New) (CBCS) (Examination, 2017
CLASSICAL MECHANICS

Day & Date: Tuesday, 25-04-2017 Max. Marks: 70

Time: 10.30 AM to 01.00 PM

Instruction :- *1) Attempt in **all Five** questions.*
*2) Q.NO.**1** and Q.NO.**2** are compulsory.*
*3) Attempt **any 3** questions from Q.No.**3** to Q.No.**7**.*
*4) Figure to the **right** indicates **full** marks.*

Q.1 A) Choose only one correct alternatives **08**

1) Constraint in case of simple pendulum attached to rigid support is an example of
   a) holonomic constraint
   b) non-holonomic constraint
   c) rheonomous constraint
   d) non-holonomic and rheonomous constraint

2) For equilibrium of a system, the virtual work done due to____.
   a) applied forces is zero.
   b) forces of constraint must be negative.
   c) both the forces stated above must be minimum.
   d) external forces must be strictly positive.

3) If Atwood's machine is kept in a ascending lift acceleration 'a' then the common accelearation of system will be ….
   a) $(g-a)\frac{m1-m2}{m1+m2}$ b) $(g+a)\frac{m1-m2}{m1+m2}$
   c) $(g-a)\frac{m1+m2}{m1-m2}$ d) $(g+a)\frac{m1+m2}{m1-m2}$

4) The product of 'Lagrangian' for the system and 'time' has dimensions of …..
   a) angular momentum b) linear momentum
   c) energy d) Impulse

5) According to Newton's third law, action-reaction pair …
   a) exits simultaneously but each one of them acts on two different objects.
   b) acts on same object.
   c) exits simultaneously but effective force on a object is zero.
   d) exits at two different time instants but act on two different objects

6) In harmonic oscillator, the phase difference between its position(q) and velocity(v) is

a) π b) $\frac{\pi}{2}$

c) 2π d) 0

7) The physical significance of "Hamilton Principle" is
   a) nature behave economically
   b) power consumption is conservative system is maximum.
   c) energy consumption in conservative system is maximum.
   d) restricted for classical system alone.

8) In projectile motion, under gravitational force horizontal component of velocity ..
   a) changes continuously. b) remains constant.
   c) changes in magnitude only. d) Zero.

B) State True or False **06**

1) Dissipation always leads to negative work.
2) In Euler-Lagrangian formulation of mechanism, $\frac{\partial L}{\partial q}$ represents a generalized force.
3) Hamilton's principle is differential principle.
4) Cycle co-ordinates are also known as ignorable co-ordinates.
5) In case of conservative system, forces are derivable from a scalar function known as potential.
6) Poisson's bracket always changes under canonical transformation.

Q.2 Answer the following questions.

a) Show that Newton's laws are invariant under Galilean transformation. **05**
b) Discuss the motion of gyroscope. **05**
c) Write a note on symmetries and conservation laws. **04**

Q.3 Attempt the following questions.

a) Derive Euler-Lagrange's equation from Hamilton's principle. **10**
b) Write a short note on Hamilton's principle. **04**

Q.4 Attempt the following questions.

a) Obtain the solution of harmonic oscillator problem using Hamilton-Jacobi equation. **08**
b) Discuss the properties of Poisson's bracket. **06**

Q.5 Attempt the following questions.

a) Derive Hamilton's canonical equation of motion **08**
b) Reduce two-body central force problem to one-body problem. Give two example of it. **06**

Q.6 Attempt the following questions.

a) What are constraints? Give detailed classification of it with example of each. **08**
b) What are difficulties introduced by the constraints and how they are removed? **06**

Q.7 Attempt the following questions.

a) Show that in canonical transformation, Poisson's bracket does not vary. **08**
b) Prove Jacobi's identity. **06**

Seat No.	

Physics (Applied Electronics) (Sem – I)(Old)(CBCS) Examination, 2017
MATHEMATICAL TECHNIQUES

Day & Date: Tuesday, 18-04-2017 Max. Marks: 70

Time: 10.30 AM to 01.00 PM

N.B. : *1) Q.**1** and Q.**2** are **compulsory.***
*2) Attempt **any three** questions from Q. **3** to **7**.*
3) All questions carry equal marks.

Q.1 A) Choose correct alternatives: **08**

1) If is $\begin{pmatrix} -4.5 \\ -4 \\ 1 \end{pmatrix}$ an eigenvector of $\begin{pmatrix} 8 & -4 & 2 \\ 4 & 0 & 2 \\ 0 & -2 & -4 \end{pmatrix}$, then the eigenvalue corresponding to the eigenvector is
a) 1 b) 4 c) - 4.5 d) 6

2) The inverse Laplace transform, $L^{-1}\left(\frac{5}{s^2+25}\right)$ = _____
a) sin 5t b) cos 5t c) sin 25t d) cos 25t

3) The points at which $f(z) = \frac{1}{z^2+1}$ is not analytical are _____
a) 1 and -1 b) i and -i
c) 1 and i i d) -1 and -i

4) The $f(z)$ is analytic, then $[f(z^*)]^*$ is _____
a) analytical b) not analytical
c) analytical when x=0 d) analytical when z=1

5) Cauchy-Riemann equations are _____
a) $u_x = v_y$ and $u_y = -v_x$ b) $u_x = v_y$ and $u_y = v_x$
c) $u_x = v_x$ and $u_y = -v_y$ d) $u_x = -v_y$ and $u_y = v_x$

6) A periodic function is given by a function which _____
a) has a period, $T = 2\pi$ b) satisfies $f(t+T) = f(t)$
c) satisfies $f(t+T) = -f(t)$ d) has a period $T = \pi$

7) The property of Fourier transform which states that the compression in time domain is equivalent to expansion in the frequency domain is _____
a) Duality b) Scaling
c) Time Scaling d) Frequency shifting

8) The general solution to $\frac{d^2y}{dt^2} + 4\frac{dy}{dt} - 4y = 0$ is _____
a) $y(t) = A\,e^{-2t} + Bt\,e^{-2t}$ b) $y(t) = A\,e^{2t} + B\,e^{-2t}$
c) $y(t) = A\,e^{2t} + B\,e^{-6t}$ d) $y(t) = A\,e^{\left(-2+\sqrt[2]{2}\right)t} + Bt\,e^{\left(-2-\sqrt[2]{2}\right)t}$

Q.1 B) State True or False: **06**

1) If $f(z)$ is analytic in a domain D containing a simple closed contour Γ, then $\int f(z)dz = 0$
2) Any entire function is the complex derivative of another entire function.
3) The square of a non-zero square matrix must be a non-zero matrix.
4) For a differential equation in the form, $a\frac{d^2y}{dx^2} + b\frac{dy}{dx} + cy = 0$; there are two complex conjugate roots, when $b^2 - 4ac < 0$
5) The Fourier series will not be uniformly convergent at all points if it represents a discontinuous function.
6) The Fourier transform of the convolution of two functions $f(t)$ & $g(t)$ is equal to the product of the Fourier transforms of $f(t)$ & $g(t)$

Q.2 Write short notes on: **14**

a) Derivative of $f(z)$ and analyticity **05**
b) Linear dependent and independent set of vectors with example. **04**
c) Second-order homogeneous differential equations with constant coefficient. **05**

Q.3 A) Using residues, evaluate the following improper integral, **08**

$$I = \int_0^{\infty} \frac{dx}{x^4 + 1}$$

B) Find the residue of the function, $f(z) = \frac{1}{z(e^z - 1)}$ **06**

Q.4 A) Find the eigenvalues and eigenvectors of the matrix, **08**

$A = \begin{pmatrix} 0 & 0 & 1 \\ 0 & 1 & 0 \\ 1 & 0 & 0 \end{pmatrix}$ Diagonalize the matrix A

B) Solve the differential equation, **06**

$\frac{d^2y}{dx^2} + y = 0$; Give that $y(0) = 2$ and $y\left(\frac{\pi}{2}\right) = -2$

Q.5 A) Develop the Fourier series representation of **08**

$$f(x) = \begin{cases} -\sin \omega t; & -\pi \le \omega t \le 0 \\ \sin wt; & 0 \le \omega t \le \pi \end{cases}$$

B) Find the Fourier series for $f(x) = x^2$ in $[-\pi, \pi]$ **06**

Q.6 A) Using the Fourier transform, solve the one-dimensional heat equation **08**

$$\frac{\partial^2 T(x,t)}{\partial x^2} - \frac{1}{L}\frac{\partial T(x,t)}{\partial t}; \qquad [T(x,0) = f(x)]$$

B) Use Laplace transform and solve the initial value problem as **06**

$$y'' + 3y' + 2y = e^{-t}; \qquad y(0) = y'(0) = 0$$

Q.7 **A)** a) Show that the Fourier sine and cosine transforms of e^{-at} are **08**

$$g_s(\omega) = \sqrt{\frac{2}{\pi}}\left(\frac{\omega}{\omega^2+a^2}\right);\ g_c(\omega) = \sqrt{\frac{2}{\pi}}\left(\frac{a}{\omega^2+a^2}\right)$$

b) Show that

$$\int_0^\infty \frac{\omega \sin \omega x}{\omega^2 + a^2}\, d\omega = \frac{\pi}{2}\, e^{-ax}, \quad x > 0$$

B) Use the Laplace transform and evaluate the following definite integral **06**

$$f(t) = \int_0^\infty \frac{\sin tx}{x}\, dx\ ; \qquad \text{for } t > 0$$

SLR-RO - 705

Seat No.	

M.Sc. (Physics-Applied Electronics) (Semester – I) (Old)
(CBCS) Examination, 2017
ANALOG & DIGITAL ELECTRONICS

Day & Date: Saturday, 22-04-2017 Max. Marks: 70

Time: 10.30 AM to 01.00 PM

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2) For generating 1 kHz signal, the most suitable circuit is Wien bridge oscillator. (True/False)
3) A one-to-sixteen demultiplexer requires 4 select input lines. (True/False)
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5) Current through a virtual ground is _____.
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Q.2 Write short notes. **14**

a) Discuss the terminal properties of an ideal operational amplifier. **05**
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c) Write briefly on instrumentation amplifier. **04**

Q.3 A) Draw the block schematic of a typical operational amplifier and briefly explain the function of each block. Also give the equivalent circuit of the op-amp. **08**

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Q.7 A) Draw the internal architecture of 8085 and explain various functional blocks. **08**

B) Write a program to find the largest number in an array of data using 8085 instruction set. **06**

Seat No.	

M.Sc. (Physics-Applied Electronics) (Semester – I) (Old)
(CBCS) (Examination, 2017
CLASSICAL MECHANICS

Day & Date: Tuesday, 25-04-2017 Max. Marks: 70

Time: 10.30 AM to 01.00 PM

Instruction :- *1) Attempt in **all Five** questions.*
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*4) Figure to the **right** indicates **full** marks.*

Q.1 A) Choose only one correct alternatives **08**

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   a) holonomic constraint
   b) non-holonomic constraint
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2) For equilibrium of a system, the virtual work done due to____.
   a) applied forces is zero.
   b) forces of constraint must be negative.
   c) both the forces stated above must be minimum.
   d) external forces must be strictly positive.

3) If Atwood's machine is kept in a ascending lift acceleration 'a' then the common accelearation of system will be ….
   a) $(g-a)\frac{m1-m2}{m1+m2}$ b) $(g+a)\frac{m1-m2}{m1+m2}$
   c) $(g-a)\frac{m1+m2}{m1-m2}$ d) $(g+a)\frac{m1+m2}{m1-m2}$

4) The product of 'Lagrangian' for the system and 'time' has dimensions of …..
   a) angular momentum b) linear momentum
   c) energy d) Impulse

5) According to Newton's third law, action-reaction pair …
   a) exits simultaneously but each one of them acts on two different objects.
   b) acts on same object.
   c) exits simultaneously but effective force on a object is zero.
   d) exits at two different time instants but act on two different objects

6) In harmonic oscillator, the phase difference between its position(q) and velocity(v) is

a) π b) $\frac{\pi}{2}$

c) 2π d) 0

7) The physical significance of "Hamilton Principle" is
   a) nature behave economically
   b) power consumption is conservative system is maximum.
   c) energy consumption in conservative system is maximum.
   d) restricted for classical system alone.

8) In projectile motion, under gravitational force horizontal component of velocity ..
   a) changes continuously. b) remains constant.
   c) changes in magnitude only. d) Zero.

B) State True or False **06**

1) Dissipation always leads to negative work.
2) In Euler-Lagrangian formulation of mechanism, $\frac{\partial L}{\partial q}$ represents a generalized force.
3) Hamilton's principle is differential principle.
4) Cycle co-ordinates are also known as ignorable co-ordinates.
5) In case of conservative system, forces are derivable from a scalar function known as potential.
6) Poisson's bracket always changes under canonical transformation.

Q.2 Answer the following questions.

a) Show that Newton's laws are invariant under Galilean transformation. **05**
b) Discuss the motion of gyroscope. **05**
c) Write a note on symmetries and conservation laws. **04**

Q.3 Attempt the following questions.

a) Derive Euler-Lagrange's equation from Hamilton's principle. **10**
b) Write a short note on Hamilton's principle. **04**

Q.4 Attempt the following questions.

a) Obtain the solution of harmonic oscillator problem using Hamilton-Jacobi equation. **08**
b) Discuss the properties of Poisson's bracket. **06**

Q.5 Attempt the following questions.

a) Derive Hamilton's canonical equation of motion **08**
b) Reduce two-body central force problem to one-body problem. Give two example of it. **06**

Q.6 Attempt the following questions.

a) What are constraints? Give detailed classification of it with example of each. **08**
b) What are difficulties introduced by the constraints and how they are removed? **06**

Q.7 Attempt the following questions.

a) Show that in canonical transformation, Poisson's bracket does not vary. **08**
b) Prove Jacobi's identity. **06**

Seat No.	

M.Sc.(Semester – II) (New) (CBCS) Examination, 2017
PHYSICS (APPLIED ELECTRONICS)
Quantum Mechanics

Day & Date: Wednesday, 19-04-2017 Max. Marks: 70

Time: 10:30 AM to 01.00 PM

N.B. : *1) Q. No. **(1)** and Q. No **(2)** are compulsory.*
*2) Attempt **any three** from Q. No. (3) to Q. No. (7).*
*3) Use of Non programmable calculator is **allowed**.*
*4) **All** questions carry **equal** marks.*

Q.1 A) Choose correct alternative: **06**

1) How does the probability of an electron tunneling through a potential barrier vary with the thickness of the barrier?
   a) It decreases inversely with thickness.
   b) It decreases sinusoidely with thickness.
   c) It decreases exponentially with thickness.
   d) It decreases linearly with thickness.

2) Which of the following is an accurate statement concerning the simple harmonic oscillator?
   a) The potential energy varies linearly with displacement from equilibrium.
   b) The spacing between energy levels increases with increasing energy.
   c) The wave functions are sinusoidal functions.
   d) The number of nodes of the wave function increases with increasing energy.

3) The ground state energy of a harmonic oscillator is _____.
   a) $\mathrm{E} = \hbar\omega$ b) $\mathrm{E} = \frac{\hbar\omega}{2}$ c) $\mathrm{E} = \frac{2}{3}(\hbar\omega)$ d) $\mathrm{E} = 0$

4) Partices in degenerate energy levels all have the same-
   a) Momentum b) Quantum numbers
   c) Energy d) All the above

5) When the potential energy of a system is independent of time, the wave function of the system _____.
   a) Cannot be normalized
   b) Is directly proportional to the time
   c) Depends on the vector positions, $\vec{r_i}$, of each particle in the system.
   d) Is constant

6) If the interaction of a particles with its environment restricts the particle to a finite region of space, the result is the quantization of _____ of the particle.
   a) The momentum
   b) The energy
   c) The velocity
   d) All the above properties

B) State True or False: **08**

1) The integration of probability density, $|\psi(x)|^2$ over all space must be unity.
2) To every physically measurable quantity of a system there corresponds an operator in quantum mechanics.
3) The eigen values of an unitary operator have modulus zero.
4) A transition between a pair of states is strictly forbidden, if the sum of or difference in quantum numbers is an even number.
5) The S- type of orbitals are spherical and have infinite density on the nucleus.
6) The spin-orbit coupling splits the multiplet states of atoms and is responsible for the fine- structure in atomic spectra.
7) If $\phi_1, \phi_2, \phi_3 \ldots\ldots \phi_n$ be the atomic orbitals on atoms 1,2,3, ….n respectivety, then molecular orbitals are approximately written as $\psi = \sum_{i=1}^{n} C_i \phi_i$.
8) The small splitting of the energy levels suggests that the electron does not possesses an intrinsic magnetic moment.

Q.2 Write short notes on: **14**

1) Wave and particle nature of radiation **05**
2) Characteristic of the wave functions **04**
3) For a simple potential barrier, show that the intensities of the reflected and the incident beam are in the ratio equal to one. **05**

Q.3 a) A particle moves in a one dimensional rigid box segment of length $L(x = 0 \text{ to } x = L)$ and is in its ground state. If the right extremity of the box suddenly expands to $x = 2L$ then what is the probability that **10**

   i) The particle still retails its energy?
   ii) Loses energy? (ac) gains energy?

b) Prove that the linear momentum operator is hermitian. **04**

Q.4 a) Obtain the total wave function of a rigid rotator in the form **08**

$$\psi(\theta, \phi) = {}^{\Theta}l_i \pm M^{(\theta)} \phi_{\pm M} = (\phi) = y_{l,} \pm m^{(\theta,\phi)}$$

b) Calculate the few spherical harmonics as **06**

i) $\gamma_{o,o}(\theta, \phi)$ ii) $\gamma_{1,\pm 1}(\theta, \phi)$

Q.5 a) For a system of many electronics, obtain the overcall wave function of a n-electron system. Write the overall wave function in a determinant form. **10**

	b)	For the Helium atom, write the Hamiltonian operator and the overall wave function. Then obtain the energy (ε) which is always higher than true energy, E_o of the ground state.	**04**
Q.6	**a)**	What is the Born-Oppenheimer approximation? Write the complete wave equation for it. Interprot each term of the wave equation.	**08**
	b)	How the linear combination of atomic orbitals (LCAO) stands the basis for the calculation of approximate energies and molecular orbitals in molecules? Explain.	**06**
Q.7	**a)**	Discuss the probability densities for the is hydrogen atomic orbitals.	**06**
	b)	How the shapes of atomic orbitals are determined? Explain in detail.	**08**

Seat No.	

M.Sc. Physics(Applied Electronics)(Semester – II) (New)
(CBCS) Examination, 2017
ELECTRODYNAMICS

Day & Date: Friday, 21-04-2017 Max. Marks: 70

Time: 10:30 AM to 01.00 PM

N.B. : *1) All questions carry **equal** marks.*
*2) Q. No. **(1)** and Q. No **(2)** are compulsory.*
*3) Attempt **any three** from Q. No. (3) to Q. No. (7).*
*4) Use of Non programmable **calculator** is allowed.*

Q.1 A) Choose correct alternative: **06**

1) When a negative charge is placed at the center of the sphere, then the direction of electric field on the Gaussian surface is _____.
   a) Radially outward b) Radially inward
   c) Along the tangent to the surface d) None of the above

2) In an electromagnetic wave, the direction of magnetic field induction $\vec{B}$ is _____.
   a) Parauel to electric field $\vec{E}$ b) Perpendicular to electric field $\vec{E}$
   c) Random d) None of the above

3) The ratio of electric field vector $\vec{E}$ and magnetic field vector $\vec{H}(i,e.\frac{\vec{E}}{\vec{H}})$ has the dimension of _____.
   a) Resistance b) Inductance
   c) Capacitance d) Product of inductance and capacitance

4) The power radiated by an electric dipole is proportional to the frequency by _____.
   a) ul b) ul^2 c) ul^3 d) ul^4

5) When angle of incidence is greater than Brewster's angle, the reflected ray suffers a phase change of _____.
   a) Π b) $\frac{\Pi}{2}$ c) O $2\,\Pi$

6) Consider the reflection and refraction of a plane wave at a dielected interface, then which of the following is true.
   a) The Frequency of the wave does not change,
   b) The energy of the wave does not change,
   c) The polarization does not change,
   d) The momentum of the wave does not change

B) State true or false: **08**

1) The multipole expansion is dominated (at large distance) by the monopole term.
2) The induced electric dipole moment is approximately proportional to the electric field, $\vec{E}$ by a relation, $\vec{P} = \propto \vec{E}$; $\propto$: polarizability.
3) For good conductors, skin depth varies inversely with $\left(\frac{1}{3}\right)$ power of frequency.
4) The direction of propagation of electromagnetic wave $PS\ \vec{E}X\ \vec{B}$.
5) In a uniform magnetic field, the net magnetic force acting on a current loop is non-zero.
6) In the Lorenz gauge, we have $\vec{\nabla}, \vec{A} + \ \mu_o \varepsilon_o \ \frac{\partial V}{\partial t} = 0$.
7) In the radiation zone, $r \gg \frac{c}{ul}$
8) The equation of continuity is $\overrightarrow{\nabla}.\vec{\jmath} + \frac{\partial \varrho}{\partial t} = 0$.

Q.2 Answer the following: **05**

1) State the electrostatic boundary conditions.
2) Show that the energy stored in magnetic fields is $\left(\frac{B^2}{2\mu_o}\right)$ per unit volume.
3) How Maxwell corrected Ampere's law? What is the physical significance of displacement current?

Q.3 a) Obtain the multipole expansion for a scalar potential of a given localized charge distribution in free space. **08**

b) Show that the electric field of a pure dipole can be written in the co-ordinate- free form as $\overrightarrow{E_{dip}}\left(\vec{F}\right) = \frac{1}{4\Pi\varepsilon_o}\frac{1}{r^3}[3\left(\overrightarrow{P},\ \hat{r}\right)\hat{r} - \vec{P}]$ **06**

Q.4 a) Obtain the expression for magnetic vector potential, $\vec{A}, (\vec{r})$ in terms of a volume current $\overrightarrow{K_b} = \vec{M}\ \times\ \vec{n}$. **10**

b) Find the magnetic field of a uniformly magnetized sphere. **04**

Q.5 a) Discuss the "Reflection and Transmission at oblique Incidence" and obtain the fresnel's equations for the case of polarization in the plane of incidence. **10**

b) What is the phenomena of " Total Internal Reflection"? **04**

Q.6 a) Explain in detail the coulomb Gauge and Lorenz Gauge. **08**

b) State and prove pointing theorem. **06**

Q.6 a) Show that the total power radiated is $\langle P\rangle = \frac{\mu_o p_o^2 u l^4}{12\Pi C}$. **10**

b) What is linear half wave antenna? Sketch the vertically set $\frac{\lambda}{\propto}$ antena. **04**

Seat No.	

Physics (Applied Electronics) (Semester – II) (New)
(CBCS) Examination, 2017
STATISTICAL MECHANICS

Day & Date: Monday, 24-04-2017 Max. Marks: 70

Time: 10.30 AM to 01.00 PM

N.B. : *1) Questions **NO.1** and **2** are **Compulsory.***
*2) Answer **any three** from **Q.NO.3** to **Q.NO.7.***
*3) Figures to the **right** indicate **full** marks*
4) All question carry equal marks.

Q.1 Choose the correct alternative: **06**

A) 1) A first order phase transition is characterized by
a) A divergence of the specific heat at Tc, the critical temperature.
b) A cusp in the average energy at Tc.
c) The constancy of entropy in the transition.
d) The latent heat is involved in the transition process.

2) For a system in thermodynamic equilibrium the following must be necessarily constant throughout the system:
a) Temperature and pressure.
b) Temperature and not pressure.
c) Pressure and chemical potential.
d) Temperature, pressure and chemical potential.

3) Which of the following atoms cannot exhibit Bose-Einstein condensation, even in principle?
a) $^{1}H_{1}$ b) $^{4}H_{e2}$ c) $^{23}Na_{11}$ d) $^{40}K_{19}$

4) A photon gas is at thermal equilibrium at temperature T. The mean number of photons in an energy state $\epsilon = \hbar\omega$ is
a) $exp\left(\frac{\hbar w}{kT}\right) + 1$ b) $exp\left(\frac{\hbar w}{kT}\right) - 1$
c) $\left(exp\left(\frac{\hbar w}{kT}\right) + 1\right)^{-1}$ d) $\left(exp\left(\frac{\hbar w}{kT}\right) - 1\right)^{-1}$

5) For the Fermi-Dirac distribution, probability of occupation of a single particle energy level is equal to:
a) The average occupancy of that level.
b) One
c) ½ the average occupancy of that level
d) Zero

6) Which of the following thermodynamic relation is incorrect?
a) $P = \left(\frac{\partial F}{\partial V}\right)_T$ b) $T = \left(\frac{\partial G}{\partial V}\right)_P$

c) $S = -\left(\frac{\partial F}{\partial V}\right)_V$ d) $P = -\left(\frac{\partial U}{\partial V}\right)_S$

Here P,V,T are the pressure, volume and temperature, and F,G,S,U are the Helmholtz Free energy, Gibbs' Free energy, entropy and average energy respectively.

B) State True or False/ Fill in the blanks: **08**

1) Entropy of the ice chips in the glass is equal to the entropy of the water in the glass.
2) In canonical ensemble, the relative r.m.s. fluctuations in E are negligible.
3) At absolute zero, all fermions may be in ground state.
4) Saturation curve terminates at critical point.
5) Sound wave travels in the air is an example of isothermal change.
6) In classical statistics, the normalization condition for canonical ensemble is given by $\int_{q,p} \rho(q,p) dq dp = 1$
7) Bose _ Einstein condensation occurs in case o ideal gas.
8) He^4 particles have spin ½ .

Q.2 Write a short note on following:

1) Macroscopic and microscopic states. **05**
2) Canonical Ensemble **04**
3) Bose –Einstein condensation **05**

Q.3
1) Explain the concept of Canonical Ensemble. Obtain the expression for Gibb's Canonical distribution. **10**
2) Give three statements of Second law of thermodynamics. **04**

Q.4
1) State and explain the First law of thermodynamics. Give its applications. **08**
2) State and explain the third law of thermodynamics. **06**

Q.5
1) Explain Liouville's theorem in classical presentation. **10**
2) What is principle of conservation of density in Liouville's theorem? **04**

Q.6
1) Give the expressions for thermodynamic functions for Gibb's Canonical Ensemble. **08**
2) State the types of ensembles, with their definitions, in the application statistical mechanics. **06**

Q.7
1) Develop Langevin theory of Brownian motion of particles. Derive Einstein's relation for diffusion in this case. **10**
2) Develop the theory for Cluster expansion for classical gas. **04**

SLR-RO – 711

Seat No.	

M.Sc. (Applied Electronics) (Semester – II) (Old)
(CBCS) Examination, 2017
QUANTUM MECHANICS

Day & Date: Wednesday, 19-04-2017 Max. Marks: 70

Time: 10.30 AM to 01.00 PM

N.B. : *1) Q.**1** and Q.**2** are **compulsory.***
*2) Attempt **any three** questions from Q. **3** to **7**.*
*3) All questions carry **equal** marks.*
4) Use of non programmable calculator is allowed

Q.1 A) Choose correct alternatives: **08**

1) The normalization constant 'a' of the following wave function is _____
The wave function is $a/\psi >= \begin{bmatrix} 3i \\ -4i \end{bmatrix}$
a) $\frac{1}{25}$ b) $\frac{1}{5}$ c) $-\frac{1}{7}$ d) $\frac{1}{7}$

2) The De – Broglie wavelength of a metal ball of mass 20 grams, moving with a velocity of 100 m/s will be _____.
a) 3.3 X 10^{-30} cm/s b) 3.3 X 10^{-30} m/s
c) 3.3 X 10^{-32} m/s d) 3.3 X 10^{-32} cm/s

3) A free particle energy spectrum has – energy values
a) discrete b) continuous
c) quantized d) none of these

4) If a system in a particular state is defined by a wave function
$\psi(x) = \sqrt{\frac{1}{4}}\ \psi_1(x) + \sqrt{\frac{1}{3}}\ \psi_2(x) + \sqrt{\frac{1}{11}}\psi_2(x)$
where ψ_1, ψ_2, ψ_3 correspond to energies E_1, E_2, E_3 respectively, then the probability of finding the system in energy state E_3 is _____
a) $\frac{1}{6}$ b) $\frac{1}{11}$ c) $\frac{1}{3}$ d) $\frac{1}{4}$

5) The first Bohr radius is _____
a) 0.5 nm b) 5 nm c) 0.05 A^0 d) 0.05 nm

6) If a diatomic molecule is treated as a Harmonic oscillator then the selection rule for vibrational transitions is _____.
a) $\Delta\vartheta = +1$ b) $\Delta\vartheta = -1$ c) $\Delta\vartheta = \pm 1$ d) $\Delta\vartheta = 0$

7) How may electrons can be accommodated in 'O' shell
   a) 32 b) 50 c) 72 d) None of these

8) A particle is confined to a box of width a. The probability diversity of finding the particle is _____ in the middle of the box for the level n = 3
   a) zero b) half c) one d) infinite

9) The eigen functions of Hydrogen atom contain which of the following:
   1. Legendre polynomials
   2. Laguerre polynomials
   3. Hermite polynomials

   a) 1, 2 and 3 b) 1 and 2 c) 2 and 3 d) 2 only

10) One of the following is an energy operator in quantum mechanics, it is _____
   a) $-\mathrm{i}\,\hbar\,\frac{\partial}{\partial \mathrm{t}}$ b) $+\mathrm{i}\,\hbar\,\frac{\partial}{\partial \mathrm{t}}$ c) $-\mathrm{i}\,\hbar\,\frac{\partial}{\partial \mathrm{x}}$ d) $+\mathrm{i}\,\hbar\,\frac{\partial}{\partial \mathrm{x}}$

11) Among the expression given below, which alternative explains Hooks law?
   a) $\mathrm{F} = -\mathrm{kx}$ b) $\mathrm{F} = \frac{-\mathrm{dv}}{\mathrm{dx}}$ c) $\mathrm{F} = \mathrm{ma}$ d) None of these

12) $\psi(\mathrm{x}) = \tan \mathrm{x}$ where $\psi(\mathrm{x})$ is wave function. $\psi(\mathrm{x})$ has _____
   a) Even parity b) Odd parity c) Both d) None of these

13) H_2^+ ion has _____
   a) two protons and an electron b) two protons and two electrons
   c) two electrons and one proton d) None of these

14) The Born Oppenheimer approximation is valid if the molecular energy levels are _____
   a) degenerate b) widely separated
   c) close to each other d) almost continuous

Q.2 Write short notes on:

a) Explain the desired properties of an acceptable wave functions. **05**

b) Using the given formula, calculate the Hermite Polynomial for n = 2 **05**

$$\mathrm{H_n}(\xi) = (-1)^{\mathrm{n}}\, \mathrm{e}^{\xi^2} \frac{\mathrm{d^n e^{-\xi^2}}}{\mathrm{d}\xi^{\mathrm{n}}}$$

c) With a suitable example, explain Heisenberg's uncertainty principle. **04**

Q.3 A) A one dimensional box is defined by a potential $\mathrm{V} = 0$ for $0 < x < a$ and $\mathrm{v} = \infty$ for $\mathrm{x} < 0$ and $\mathrm{x} > a$, where a is width. Set up the Schrödinger's equations and using bounding condition, obtain expression for energy and normalized wave function. **10**

B) Explain how the color is influenced by different parameters of a box. **04**

Q.4 A) Write the Schrödinger's wave equations for Harmonic oscillator in **10**

x dimension. By proper substitutions, obtain the solvable equation. Derive the expression for recursion relation and energy.

B) Obtain the Normalized wave functions of Harmonic oscillator. Explain the ground, state wave function of Harmonic oscillator. **04**

Q.5 **A)** Separate out the r, Θ and ϕ parts equations from the Schrödinger equation in spherical polar co-ordinates of Hydrogen part and solve the ϕ part. **10**

B) Calculate the probability density of 1s orbital of Hydrogen atom. **04**

Q.6 **A)** Define the Hamiltonian in Helium atom, choosing proper wave function, the ground state energy by minimizing it. (Variational method) **12**

The 1 S orbital is given as

$$1S = \left(\frac{\xi'^3}{\pi}\right)^{\frac{1}{2}} \exp(-\xi', r)$$

B) Comment on variational method. **02**

Q.7 **A)** Discuss the system for Hydrogen molecule ion. Set up the Hamiltonian for the system. Using the LCAO theory, define the ψ_1 and ψ_2 wave function. **08**

B) Obtain an expression for E_1 and E_2 levels in terms of P, Q and S where they have usual meanings. **06**

SLR-RO- 712

Seat No.	

M. Sc. Physics (Applied Electronics) (Semester – II) (Old) (CBCS) Examination, 2017
ELECTRODYNAMICS

Day & Date: Friday, 21-04-2017 Max. Marks: 70

Time: 10.30 AM to 01.00 PM

N.B. : *1) Q.**1** and Q.**2** is **compulsory.***
*2) Attempt **any three** questions from Q. **3** to **7**.*
*3) Figures to the **right** indicate **full** marks.*

Q.1 A) Choose correct alternatives: **08**

1) When a potential difference is applied across human heart, its behavior can be modeled as that of electric dipole. Abnormal hearts can be detected by mapping.
   a) Equipotential surfaces b) Electric flux lines
   c) Electric fields d) All of the above

2) The electric flux density D is
   a) normal b) tangential
   c) opposite d) unrelated
   to the electric flux lines

3) The electric field E is
   a) normal b) tangential c) opposite d) unrelated

4) If a dipole is displaced through a small distance and the original dipole is then replaced by one of the same magnitude but of opposite sign
   a) a monopole is formed b) multipoles are formed
   c) octupole is formed d) quadrupole is formed

5) The depth of penetration is defined as that depth in which the wave attenuates to
   a) .50% of its strength before penetration
   b) 20% of its strength before penetration
   c) 70% of its strength before penetration
   d) I/e times of its strength before penetration

6) The formulae relating the amplitude of the reflected and transmitted waves with that of incident wave are known as
   a) .Fresnel formulae b) .Fraunhofer formulae
   c) .Kirchhoff formulae d) .Maxwell formulae

7) An electromagnetic wave has electric field component along y-direction and magnetic field cpmmponent along x-direction.

The electromagnetic wave is propagating along
a) .z direction b) .-z direction c) .x direction d) y direction

8) In a good conductor, for electromagnetic wave operating at 1 GHz, the E and H will be out of phase at a distance $z/\lambda = 1.0$ by
a) 45^o b) 30^o c) 60^o d) 90^o

B) True or False: **06**

1) Even if Poynting vector is zero, some electromagnetic energy can flow across a closed surface-
2) Maxwell's equations are viewed as a unification of magnetic and electric forces.
3) The field vectors E and H are attenuate exponentially as the wave penetrates the conducting medium.
4) Theory of steady current is called a Magnetostatics.
5) In electrostatics and magnetostatics, Newton's third law holds, but in electrodynamics it does not.
6) The distance it takes to reduce the amplitude of electromagnetic wave by a factor of I/e is called as skin depth.

Q.2 Write short answers on the following:

1) Write the boundary conditions for a linear media in terms of E and B alone. **04**
2) Write the Maxwell's equation for free space in differential form. **04**
3) Write Maxwell's equation for a moving media. **04**
4) Write the word statements of the Maxwell's equation written in integral form. **02**

Q.3 a) By considering the reflection and refraction of electromagnetic waves at oblique incidence, derive three fundamental laws of geometrical optics. **08**

b) Obtain Poynting theorem for the conservation of energy for the electromagnetic field. **06**

Q.4 a) Write a note on Coulomb and Lorentz guage. **08**

b) Obtain Wave equations in terms of electromagnetic potentials. **06**

Q.5 a) Using the theory of electric dipole radiation explain the blueness of the sky and redness of the sunset. **08**

b) Find out the power radiated by an oscillating electric dipole and describe its angular distribution. **06**

Q.6 a) Find the directivity (maximum) of a half wave dipole. **08**

b) Write a note on Gauge transformations. **06**

Q.7 a) A plane electromagnetic wave is incident on a plane boundary between the two non-conducting media. Specify the boundary conditions and hence derive Fresnel's formulae for the reflected and transmitted intensities. **08**

b) Describe the use of Hertz potential in computation of radiation fields. **06**

SLR-RO- 713

Seat No.	

M. Sc. Physics (Applied Electonics) (Semester – II) (Old) (CBCS) Examination, 2017
STATISTICAL MECHANICS

Day & Date: Monday, 24-04-2017 Max. Marks: 70

Time: 10.30 AM to 01.00 PM

N.B. : *1) Q.**1** and Q.**2** is **compulsory.***
*2) Attempt **any three** questions from Q. **3** to **7**.*
*3) Figures to the **right** indicate **full** marks.*

Q.1 a) Choose correct alternatives: **08**

1) Which of the following is not example of second order phase transition?
   a) Iron ferromagnetic to paramagnetic state at Tc
   b) Conductor to superconductor at Tc.
   c) Water into vapour at Tc
   d) Liquid He I to liquid He II at T_λ

2) The statement of First law of thermodynamics in case of liquid film is
   a) $Tds = dU + SdA$ b) $TdS = dU - SdA$
   c) $TdS = dU - FdL$ d) $TdS = dU + FdL$

3) For two assemblies of equal volumes are at same temperature and pressure, the entropy on removing partition becomes $S_T = 2S + 2Nk\ In2$. The factor $2Nk$ In 2 arise due to
   a) The indistinguishability of classical particles.
   b) The distinguishability of classical particles
   c) The steady flow of particles
   d) The absence of interpaticle interaction

4) In isotherms of liquid- gas transition (van der Waals curves) of real gas.
   a) Maxima and minima points come closer with rise in temperature.
   b) Maxima and minima points turn away with rise in temperature.
   c) There are no maxima and minima points in the region T<Tc.
   d) There are maxima and minima points in the region T>Tc.

5) In relation to statistical mechanics _____ (Choose incorrect statement)
   a) All particles of a given kind are treated as mutually

indistinguishable.

b) The phase space of n degrees of freedom will have $2n$ dimensions its unit cell volume will be h^n.

c) With a system having $N \sim N^{23}$ particles, probability of two halves of a box having particle density difference of 0.0001% in negligibly small.

d) Photons may be treated as following Fermi-Dirac statistics.

6) An ensemble is considered to be in statistical equilibrium if

a) $\frac{d\rho}{dt} = 0$ b) $[\rho, H] + \frac{d\rho}{dt} = 0$

c) $\frac{\boldsymbol{dq}}{\boldsymbol{dT}} = \mathbf{0}$ d) $\frac{d\rho}{dT} = 0$

Q.1 b) State true or false: **08**

1) He^4 are bosons.
2) $^{40}K_{19}$ atoms can exhibit Bose-Einstein condensation.
3) The thermodynamic properties of a system derived for canonical ensemble and microcanonical ensemble are identical.
4) Particles having spin= ½ are known as Bosons.
5) The complete phase space is the sum of configuration and momentum spaces.
6) Bursting of cycle tube is an example of isothermal change.
7) In canonical and grand canonical ensembles, the relative r.m.s. fluctuations in E are negligible.
8) The total wave function of the Bose-Einstein system is symmetric under exchange of co-ordinate of any particles.

Q.2 Write short answers on the following:

1) Tisza two find model to explain He I to He II transition. **05**
2) Zeroth law of thermodynamics. **04**
3) Clasius Clayperon equation. **05**

Q.3 **a)** Give the expression for thermodynamic functions for Gibb's Canonical Ensemble. **10**

b) Differentiate between Bosons and Fermions. **06**

Q.4 **a)** Explain Liouville's theorem in classical presentation. **08**

b) Obtain the 'equation of state' for an ideal Bose gas. **06**

Q.5 **a)** Discuss in detail the case of weakly degenerate ideal Fermi Gas. **08**

b) Differentiate between microscopic and microscopic states. **06**

Q.6 **a)** Develop Langevin theory of Brownian motion of particles. Derive Einstein's relation for diffusion coefficient in this case. **08**

b) Explain P-T diagram of one component system. **06**

Q.7 **a)** Explain Liouville's theorem in classical presentation. **10**

b) Write noteon Gibb's paradox. **04**

SLR-RO – 714

Seat No.	

M.SC. Physics (Applied Electronics) (Semester – II) (Old) (CBCS) Examination, 2017
Microprocessors And Microcontrollers

Day & Date: Saturday, 29-04-2017 Max. Marks: 70

Time: 10.30 AM to 01.00 PM

Instructions: *1)* ***Q.1 and Q.2 are compulsory.***
2) Solve any ***three*** *questions from Q.3 to Q.7.*
3) Figures to right indicate ***full marks.***

Q.1 A) Choose the correct option: **08**

1) _____ SFR is not bit addressable.
   a) Acc b) SBUF c) PSW d) Port 0

2) The alternate function of the P3.2 is
   a) Serial input port b) External interrupt 0
   c) Data memory write strobe d) External interrupt 1

3) ISR ends with.
   a) IE b) RET c) RETI d) RI, TI

4) To set the baud rate 2400 in serial communication TH1 register must be loaded with _____. (Assume XTAL = 11.0592 MHz, SMOD = 1)
   a) EF b) E8 c) FA d) FD

5) The Trap Flag (TF) is set to perform.
   a) Step by step execution during debugging
   b) To enable interrupt
   c) The string operation
   d) None of these

6) For the segment register DS the offset registers used are.
   a) IP, BP b) BX, DI, SI c) SP, BP d) SI, DI

7) The REP (Repeat execution of string instructions while CX is not 0) is.
   a) Directive b) Label
   c) Mnemonics d) Prefix for string instruction

8) The total flags available in PSW of 8086 are.
   a) 5 b) 9 c) 6 d) 8

B) State True or False: **06**

1) The PCON SFR is not a bit addressable.
2) The DEC DPTR is a illegal instruction.
3) External interrupt is having lowest priority in 8051.
4) LJMP is a three byte instruction.
5) The interrupt with type number 0 is dedicated to the 'divide by zero' error.
6) After reset all the interrupts of 8051 are in disabled condition.

Q.2 **a)** Explain the SFRs associated with the interrupts of 8051 **05**

b) Explain general purpose register structure of 8051. **05**

c) Explain the following instructions of 8086. **04**

i) CLD ii) DAS

Q.3 **a)** Draw and explain the PORT 1 (P1) structure. Write assembly language program to toggle the LEDs connected to P1. **08**

b) Draw and Explain the Timer / Counter logic circuit of 8051. **06**

Q.4 **a)** Write assembly language program in 8086 for multiplication of two 32 bit numbers. **08**

b) Explain segment override prefix concept with an example. **06**

Q.5 **a)** Write a assembly language program in 8051 to receive a characters serially with baud rate of 4800. Use mode 1 for serial communication. **08**

b) Explain the following instructions of 8051. **06**

i) MOVX A, @DPTR ii) CJNE A, #10H, label

Q.6 **a)** Explain the minimum mode configuration of 8086. **08**

b) Explain the bus controller 8288. **06**

Q.7 **a)** Explain the interrupt structure of 8086 **08**

b) Draw and explain the PSW format of 8051. **06**

SLR-R0 – 716

Seat No.	

Physics (Applied Electronics) (Semester–III) (Old) (CGPA) Examination, 2017
INSTRUMENTATION

Day & Date: Saturday, 22-04-2017 Max. Marks: 70

Time: 02.30 PM to 05.00 PM

N.B. : *1) Q.**1** and Q.**2** are **compulsory.***
*2) Attempt **any three** questions from Q. **3** to **7**.*
3) All questions carry equal marks.

Q.1 A) Choose correct alternatives: **08**

1) Which of the following voltmeters would you use for measuring voltage across 20 kΩ resistance
   a) Voltmeter having a resistance of 5 kΩ
   b) Voltmeter having a sensitivity of 1 K w/V
   c) Voltmeter having sensitivity of 10 k W/V
   d) None of the above

2) In a strain measuring device using a strain gauge, the output quantity is
   a) Voltage b) Resistance c) Impedance d) Either (a) or (b)

3) In an ac coordinate potentiometer, the currents in phase and quadarture potentiometer are adjusted to be
   a) Out of phase of 90^0 b) In phase
   c) Out of phase by 45^0 d) Out of phase by 180^0

4) In a CRO, the time base single is applied to
   a) X plates b) Y plates
   c) Either X or Y plates d) Alternately X and Y plates

5) Which of these instruments does not have a control spring?
   a) Moving iron ammeter b) PMMC ammeter
   c) Electrostatics voltmeters d) Electrostatic voltmeters

6) Which one of the following is true?
   a) Alternating voltage and current contain odd and even harmonics
   b) The inductance in a circuit reduces the effect of harmonies and makes current wave more sinusoidal than voltage wave
   c) Alternating voltage and current waveforms, in general, do not contain odd harmonics
   d) Inductance of a circuit does not alter wave shape at all

7) The current in a circuit is measured using a 150 : 1 CT. If the ammeter reads 0.6 A, the circuit current is
   a) 250 A b) 90 A c) 156 A d) 144 A

8) A Voltmeter of 0 to 250 V has error of $\pm$ 1% of full scale deflection. If the true voltage of voltmeter is 25 V then the range of its reading is
   a) 22.5 V- 27.5 V b) 27.5V- 29.5 V
   c) 24 V – 26 V d) 25.5 V – 26.5 V

B) Fill in the blanks or state True/ False: **06**

1) Two sinusoidal signals of equal amplitude and frequency are applied to X and Y plate of CRO respectively. The observed Lissajous pattern is a straight line. The phase shift between signals is ____.
2) A dual trace CRO has _____ electron guns and _____ pole switches.
3) The sensitivity of a voltmeter using 0-5 mA meter movement is _____.
4) In a low power factor wattmeter, compensation for pressure coil current is provided (True/False)
5) The braking torque in single phase energy meter is proportional to speed of disc. (True/False)
6) A multimeter can be used as ohmmeter. (True/False)

Q.2 Attempt the following: **14**

A) Explain the differences between Dual Trace Oscilloscope and Digital Storage oscilloscope.
B) Explain the main features of V to F converter.
C) Draw and explain the working of Function generator.

Q.3 A) Explain the construction and working of Velocity transducer. **08**
B) Explain how torque can be measured. **06**

Q.4 A) Discuss briefly about Instrumentation amplifier. **08**
B) Elucidate the basic principle of Sample and Hold circuit. **06**

Q.5 A) How a sine wave can be synthesized? **08**
B) Discuss the construction details of Spectrum Analyzer. **06**

Q.6 A) What is Virtual Instrumentation? Explain in brief. **08**
B) Draw and explain Data loggers. **06**

Q.7 A) Explain the construction details of Wave Analyzer. **08**
B) How can the phase sensitivity of a signal be detected? **06**

Seat No.	

M.Sc. Physics(Applied Electronics) (Semester – III) (Old) (CGPA) Examination, 2017
COMMUNICATION SYSTEMS

Day & Date: Tuesday, 25-04-2017 Max. Marks: 70

Time: 02.30 PM to 05.00 PM

N.B. : 1) Q.(1) & Q. (2) are compulsory.
2) Answer any three questions form Q.(3) to Q. (7).
3) All questions carry equal marks.

Q.1 Objectives questions. **14**

A) Select correct alternatives. **06**

1) In FM, the aptitude of the modulated frequency wave at all times remains

a) Varying b) Constant c) Dependant d) Variable

2) Envelop detection is concerned with the process of
a) Mixing b) Modulation c) Heterodyning d) Rectification

3) The main advantage of TDM over FDM is that, it
a) Guess letter S/N ratio b) Needs less power
c) Needs less bandwidth d) Needs simple circuitry

4) What is the highest percentage of modulation for AM
a) b) c) d)

5) ASK is the result of combination of aptitude modulation and
a) Analog modulation b) Digital modulation
c) Shift modulation d) None of above

6) In CDMA, the fit rate of the digital data is called
a) Chip b) Chipping frequency
c) Epoch d) Information rate

B) Fill in the blanks **04**

1) Converting analog signals to digital is done by sampling and _____.
2) _____is the category of data transmission, if the binary pulse in maintained for the entire fit time.
3) ASK, PSK, and FSK are the examples of _____to _____ encoding
4) A PAM signal is demodulated with _____filter.

C) Sate true or false. **04**

1) The ratio of maximum donation to the maximum modulating frequency is called modulation index.
2) In full duplex communication system, the flow of information takes place in both direction simultaneously.
3) Probability of error in DPSK is less than PSK.
4) The limiter stage of a FM receiver, limits the overall BW of the IF stages.

Q.2 Answer in brief. **14**

A) Explain double side bond transmission. **05**
B) Write a note on data formats. **05**
C) State and explain sampling theorem. **04**

Q.3 A) Discuss the operation of AM receiver and detector circuits. **10**
B) Write the advantages of FM over AM. **05**

Q.4 A) Explain the operation of class A, B, C modulated power amplifier circuits. **10**
B) Write a note on frequency doubles and frequency triples. **05**

Q.5 A) Describe the process of DPSK modulation and demodulation. **10**
B) Explain the working of a VCO circuit. **05**

Q.6 A) Discuss ASK modulation and demodulation process in detail. **10**
B) What is a transponder? Explain. **05**

Q.7 A) Describe the various multiple access techniques. **10**
B) Explain the generation of PTM signal. **05**

Seat No.	

M.Sc. Physics (Applied Electronics) (Semester – III)
(Old) (CGPA) Examination, 2017
ATOMIC, MOLECULAR & NUCLEAR PHYSICS

Day & Date: Thursday, 20-04-2017 Max. Marks: 70

Time: 2:30 PM to 05.00 PM

N.B. : *1) Attempt **five** questions.*
*2) **Q. (1)** and **Q. (2)** are **compulsory**.*
*3) Attempt **any three** from Q. No. (3) to Q. No. (7).*
*4) Figures to the **right** indicate **full** marks.*
*5) **Use** of non programmable calculator is **allowed.***

Q.1 A) Choose correct alternative: **06**

1) The maximum number of electron in a sub shell with orbital quantum number I is _____.
a) $(2l+1)$ b) $(2l-1)$ c) $2(2l+1)$ d) $2(2l-1)$

2) In case of jj Coupling spin s_i of each electron is quantized with respect to _____ to form a resultant j_i.
a) Another electron's l_i^* b) Its own l_i^*
c) Another electron's s_i^* d) Its own s_i^*

3) If the motion is simple harmonic the force constant is given by _____.
a) $k = 4\pi^2\bar{\omega}^2c^2$ b) $k = 4\pi^2\bar{\omega}^2c^2\mu^2$
c) $k = 4\pi^2\bar{\omega}^2c^2\mu$ d) $k = 4\pi^2\bar{\omega}^2c\mu$

4) The nuclear fission due to an absorption of a slow neutron is an example of
a) Compound nuclear reaction
b) Direct reaction
c) Neutron scattering reaction
d) Quantum mechanical tunneling

5) According to the shell model of the nucleus which is incorrect?
a) Magic number exist
b) Nucleons interact with their nearest neighbours only
c) Nucleons in a nucleus interact with a general force field.
d) Large electronic quadruple moment exists for certain nuclei.

6) The Scattering amplitude of n-p interaction is _____.
a) $F(\theta) = \frac{e^{i\delta\theta}sin\delta\theta}{k}$ b) $F(\theta) = \frac{e^{-i\delta\theta}sin\delta\theta}{k}$

c) $F(\theta) = \frac{-e^{-i\delta\theta} cos\ \delta\theta}{k}$ d) $F(\theta) = \frac{e^{-i\delta\theta} cos\delta\theta}{k}$

B) Fill in the blanks. **04**

1) For an atom in the state of $^2D_{5/2}$ the Lande 'g' factor should be _____.
2) Selection rule for the harmonic oscillator undergoing vibrational changes are _____.
3) Transition rule for the vibrational- rotational spectra are _____.
4) If Q value of nuclear reaction is positive the reaction is _____.

C) State the following sentence are True or False: **04**

1) Pauli exclusion principle state that no two electrons in the same atom can have all of their quantum numbers the different.
2) H_2O is an example of symmetric molecule.
3) The electric quadrupole moment is positive; shape of the nuclei is oblate.
4) In case of LS coupling; the triplet interval follows the Lande Interval Rule.

Q.2 Answer in brief (any 3):

a) What are the direct and indirect reactions? **04**
b) Discuss the spectrum given by linear polyatomic molecule. **04**
c) What are characteristics of n-p interaction at high energy. **05**
d) Write down the value of quantum number l and S for a d-electron and enumerate for it the possible values of the quantum numbers j and m_j. **05**

Q.3 a) Show that for low energy n-p scattering $\sigma_o = \frac{4x}{k^2} sin^2\delta_o$ where the symbols have usual meaning. **10**
b) Explain linear and symmetric top of molecules. **04**

Q.4 a) Obtain an expression for the allowed energy for diatomic non-rigid rotor. **08**
b) Discuss the nuclear reaction kinematics. **06**

Q.5 a) Explain the compound nuclear reaction process in details. **10**
b) Shows that deuteron cannot exists in excited state. **04**

Q.6 a) Obtain the expression of Lande splitting factor (g) for LS and JJ coupling. **10**
b) Discuss p-p scattering at high energy. **04**

Q.7 a) Discuss the effective range theory of low energy in np scattering. **10**
b) State and explain Pauli exclusion principle. **04**

SLR-RO- 719

Seat No.	

M. Sc. – II (Semester – III) (New) (CGPA) Examination, 2017
Semiconductor Devices (Paper IX)

Day & Date: Tuesday, 18-04-2017 Max. Marks: 70

Time: 02.30 PM to 05.00 PM

N.B. : *1) Q.**1** and Q.**2** is **compulsory.***
*2) Attempt **any three** questions from Q. **3** to **7**.*
*3) Use of non-programmable **calculator is allowed**.*

Q.1 A) Choose correct alternatives: **08**

1) The detectable range of light by the human eye is _____
   a) 0.4 μm to 0.7 μm b) 0.04 μm to 0.07 μm
   c) 4 μm to 7 μm d) 40 μm to 70 μm

2) CMOS is popular due to _____
   a) Low noise immunity b) High power consumption
   c) Low power consumption d) High power dissipation

3) Avalanche photodiodes require _____ to avoid, if from premature breakdown.
   a) Guard ring b) UV protection
   c) Dark lines d) Low bias

4) Threshold lasing current is minimum in ___ junction LASERs.
   a) Homo b) Single hetero
   c) Double hetero d) Degenerate

5) In CMOS, C stands for _____
   a) Charge b) Capacitance
   c) Complementary d) Compensating

6) A potential well is created in p type semiconductor by applying ___in CCD memory devices to store charge.
   a) Positive potential b) Negative potential
   c) Square negative potential d) Sinusoidal pulse

7) Light emission is not possible in Si due to it's _____
   a) Direct band gap b) High mobility
   c) Indirect band gap d) Doping

8) Energy required to move electron from Fermi level to outside the metal is called as _____
   a) Barrier b) Work function
   c) Depletion d) Dielectric constant

B) Fill in the blanks: **06**

1) Increase in SCR gate current causes _____(increase/decrease) in forward-break-over voltage.
2) Negative differential resistance in Gunn devices is similar is mainly due to transfer of electrons from _____(lower valley to upper valley/upper valley to lower valley)
3) The width of the junctions of SCR under forward conductor state are _____(all maximum/all minimum)
4) Induction of n-channel in p-substrate in MOSFET is called as___(diversion/inversion)
5) DIAC is known as _____(gateless/gated) SCR.
6) PUT requires _____(1.0/1.5) V if gate is biased at 0.8 V.

Q.2 Write short notes on the following:

1) Write a note on schottky diode. **05**
2) Explain dv/dt and di/dt characteristics of SCR **05**
3) What are fast recovery diodes? **04**

Q.3

a) Explain in details working mechanism of depletion and enhancement types of MOSFETs. **10**
b) What is MISFET? **04**

Q.4

a) A describe the construction of SCR and explain how it is analogous to two transistors with the help of I-V characteristics. **10**
b) Define power transistors and compare it with BJT. **04**

Q.5

a) Explain the existence and cause of negative differential resistance (NDR) in transferred electron devices. Discuss various modes of operation in Gunn diode. **10**
b) What is buried channel CCD? **04**

Q.6

a) Discuss in detail the working of p-n junction heterojunction lasers. What is the effect of temperature on the performance of the lasers? **10**
b) Explain in brief the working of photodetectors. **04**

Q.7

a) Explain the mechanism of charge trapping in MOSFETs. **08**
b) What is IGBT? **06**

Seat No.	

M.Sc. Physics (Applied Electronics) (Semester – III)
(New) (CBCS) Examination, 2017
ATOMIC, MOLECULAR & NUCLEAR PHYSICS

Day & Date: Thursday, 20-04-2017 Max. Marks: 70

Time: 2:30 PM to 05.00 PM

N.B. : *1) Attempt **five** questions.*
*2) **Q. (1)** and **Q. (2)** are **compulsory**.*
*3) Attempt **any three** from Q. No. (3) to Q. No. (7).*
*4) Figures to the **right** indicate **full** marks.*
*5) **Use** of non programmable calculator is **allowed.***

Q.1 A) Choose correct alternative: **06**

1) The maximum number of electron in a sub shell with orbital quantum number I is _____.
a) $(2l+1)$ b) $(2l-1)$ c) $2(2l+1)$ d) $2(2l-1)$

2) In case of jj Coupling spin s_i of each electron is quantized with respect to _____ to form a resultant j_i.
a) Another electron's l_i^* b) Its own l_i^*
c) Another electron's s_i^* d) Its own s_i^*

3) If the motion is simple harmonic the force constant is given by _____.
a) $k = 4\pi^2\bar{\omega}^2c^2$ b) $k = 4\pi^2\bar{\omega}^2c^2\mu^2$
c) $k = 4\pi^2\bar{\omega}^2c^2\mu$ d) $k = 4\pi^2\bar{\omega}^2c\mu$

4) The nuclear fission due to an absorption of a slow neutron is an example of
a) Compound nuclear reaction
b) Direct reaction
c) Neutron scattering reaction
d) Quantum mechanical tunneling

5) According to the shell model of the nucleus which is incorrect?
a) Magic number exist
b) Nucleons interact with their nearest neighbours only
c) Nucleons in a nucleus interact with a general force field.
d) Large electronic quadruple moment exists for certain nuclei.

6) The Scattering amplitude of n-p interaction is _____.
a) $F(\theta) = \frac{e^{i\delta\theta}sin\delta\theta}{k}$ b) $F(\theta) = \frac{e^{-i\delta\theta}sin\delta\theta}{k}$

c) $F(\theta) = \frac{-e^{-i\delta\theta} cos\ \delta\theta}{k}$ d) $F(\theta) = \frac{e^{-i\delta\theta} cos\delta\theta}{k}$

B) Fill in the blanks. **04**

1) For an atom in the state of $^2D_{5/2}$ the Lande 'g' factor should be _____.
2) Selection rule for the harmonic oscillator undergoing vibrational changes are _____.
3) Transition rule for the vibrational- rotational spectra are _____.
4) If Q value of nuclear reaction is positive the reaction is _____.

C) State the following sentence are True or False: **04**

1) Pauli exclusion principle state that no two electrons in the same atom can have all of their quantum numbers the different.
2) H_2O is an example of symmetric molecule.
3) The electric quadrupole moment is positive; shape of the nuclei is oblate.
4) In case of LS coupling; the triplet interval follows the Lande Interval Rule.

Q.2 Answer in brief (any 3):

a) What are the direct and indirect reactions? **04**
b) Discuss the spectrum given by linear polyatomic molecule. **04**
c) What are characteristics of n-p interaction at high energy. **05**
d) Write down the value of quantum number l and S for a d-electron and enumerate for it the possible values of the quantum numbers j and m_j. **05**

Q.3 a) Show that for low energy n-p scattering $\sigma_o = \frac{4x}{k^2} sin^2\delta_o$ where the symbols have usual meaning. **10**
b) Explain linear and symmetric top of molecules. **04**

Q.4 a) Obtain an expression for the allowed energy for diatomic non-rigid rotor. **08**
b) Discuss the nuclear reaction kinematics. **06**

Q.5 a) Explain the compound nuclear reaction process in details. **10**
b) Shows that deuteron cannot exists in excited state. **04**

Q.6 a) Obtain the expression of Lande splitting factor (g) for LS and JJ coupling. **10**
b) Discuss p-p scattering at high energy. **04**

Q.7 a) Discuss the effective range theory of low energy in np scattering. **10**
b) State and explain Pauli exclusion principle. **04**

Seat No.	

M.Sc. Physics (Applied Electronics) (Semester – III) (New) (CBCS) Examination, 2017
COMMUNICATION SYSTEM

Day & Date: Tuesday, 25-04-2017 Max. Marks: 70

Time: 02.30 PM to 05.00 PM

Instruction :-

1) Q.NO.1 and 2 are compulsory.
2) Attempt any 3 questions from Q.No3 to Q.No.7.
3) All questions carry equal marks.

Q.1 A) Select correct alternatives **06**

1) When amplitude of the modulating voltage is, increase for AM, the antenna current will
   a) increase b) decrease
   c) remain constant d) decrease exponentially

2) In FM, the change in carrier frequency in proportional to what attribute of the modulating signal
   a) frequency b) amplitude c) angle d) tone

3) The main advantage of TDM are FDM is that, it
   a) Needs less power b) Needs less bandwidth
   c) Gives better S/N ratio d) Needs simple circuitry

4) ASK is rarely used in modems because,
   a) it shifts only between on & off
   b) it takes care of amplitude only
   c) it shifts between amplitude and phase
   d) it is highly susceptible to noise

5) The process of adding intelligence on the carrier is called
   a) Modulation b) Detection
   c) mixing d) adding

6) A carrier signal has
   a) A constant amplitude b) A frequency above 20KHZ
   c) A varying amplitude d) The information content

B) Fill in the blanks: **04**

1) The modulation index of an AM wave is changed from Zero to One. The transmitted power is increased by _____ %
2) The intermediate frequency of a ratio receives is _____is KHZ.
3) A PAM signal is demodulated with _____ filter
4) In telegraphy, _____ modulation is often used.

C) State true or false: **04**

1) The ratio of maximum deviation to the maximum modulating frequency is called modulation index.
2) PSK scheme conveys data by changing the phase of reference signal.
3) In full duplex communication system, the flow of information takes place in both directions simultaneously.
4) Narrow bandwidth is the main advantage of FM over AM

Q.2 Answer in brief: **14**

a) Discuss low level and high level modulation **(5)**
b) Explain the half duplex communication system **(5)**
c) Write a brief note on data formats **(4)**

Q.3 a) Draw the block diagram of FM receives circuit and explain its operation **10**
b) What is PLL? Explain. **05**

Q.4 a) Write the principle of data modulation. With neat diagram, explain the working of delta modulator and demodulator circuits. **10**
b) Write a note on frequency doublers and frequency triple circuits. **05**

Q.5 a) With a neat diagram, describe in detail, the process pulse amplitude modulation and demodulation. **10**
b) Explain the generation of PTM **05**

Q.6 a) Discuss the process of FSK modulation and demodulation in detail. Draw the necessary diagram and waveforms **10**
b) Explain the simplex Communication System. **05**

Q.7 a) With relevant diagram and waveforms, explain the functioning of CDMA systems. **10**
b) Write a brief note on TDMA **05**

SLR-R0 – 722

Seat No.	

Physics (Applied Electronics) (Semester–III) (New) (CBCS) Examination, 2017
INSTRUMENTATION

Day & Date: Saturday, 22-04-2017 Max. Marks: 70

Time: 02.30 PM to 05.00 PM

N.B. : *1) Q.**1** and Q.**2** are **compulsory.***
*2) Attempt **any three** questions from Q. **3** to **7**.*
3) All questions carry equal marks.

Q.1 A) Choose correct alternatives: **08**

1) Which of the following voltmeters would you use for measuring voltage across 20 kΩ resistance
   a) Voltmeter having a resistance of 5 kΩ
   b) Voltmeter having a sensitivity of 1 K w/V
   c) Voltmeter having sensitivity of 10 k W/V
   d) None of the above

2) In a strain measuring device using a strain gauge, the output quantity is
   a) Voltage b) Resistance c) Impedance d) Either (a) or (b)

3) In an ac coordinate potentiometer, the currents in phase and quadarture potentiometer are adjusted to be
   a) Out of phase of 90^0 b) In phase
   c) Out of phase by 45^0 d) Out of phase by 180^0

4) In a CRO, the time base single is applied to
   a) X plates b) Y plates
   c) Either X or Y plates d) Alternately X and Y plates

5) Which of these instruments does not have a control spring?
   a) Moving iron ammeter b) PMMC ammeter
   c) Electrostatics voltmeters d) Electrostatic voltmeters

6) Which one of the following is true?
   a) Alternating voltage and current contain odd and even harmonics
   b) The inductance in a circuit reduces the effect of harmonies and makes current wave more sinusoidal than voltage wave
   c) Alternating voltage and current waveforms, in general, do not contain odd harmonics
   d) Inductance of a circuit does not alter wave shape at all

7) The current in a circuit is measured using a 150 : 1 CT. If the ammeter reads 0.6 A, the circuit current is
   a) 250 A b) 90 A c) 156 A d) 144 A

8) A Voltmeter of 0 to 250 V has error of $\pm$ 1% of full scale deflection. If the true voltage of voltmeter is 25 V then the range of its reading is
   a) 22.5 V- 27.5 V b) 27.5V- 29.5 V
   c) 24 V – 26 V d) 25.5 V – 26.5 V

B) Fill in the blanks or state True/ False: **06**

1) Two sinusoidal signals of equal amplitude and frequency are applied to X and Y plate of CRO respectively. The observed Lissajous pattern is a straight line. The phase shift between signals is ____.
2) A dual trace CRO has _____ electron guns and _____ pole switches.
3) The sensitivity of a voltmeter using 0-5 mA meter movement is _____.
4) In a low power factor wattmeter, compensation for pressure coil current is provided (True/False)
5) The braking torque in single phase energy meter is proportional to speed of disc. (True/False)
6) A multimeter can be used as ohmmeter. (True/False)

Q.2 Attempt the following: **14**

A) Explain the differences between Dual Trace Oscilloscope and Digital Storage oscilloscope.
B) Explain the main features of V to F converter.
C) Draw and explain the working of Function generator.

Q.3 A) Explain the construction and working of Velocity transducer. **08**
B) Explain how torque can be measured. **06**

Q.4 A) Discuss briefly about Instrumentation amplifier. **08**
B) Elucidate the basic principle of Sample and Hold circuit. **06**

Q.5 A) How a sine wave can be synthesized? **08**
B) Discuss the construction details of Spectrum Analyzer. **06**

Q.6 A) What is Virtual Instrumentation? Explain in brief. **08**
B) Draw and explain Data loggers. **06**

Q.7 A) Explain the construction details of Wave Analyzer. **08**
B) How can the phase sensitivity of a signal be detected? **06**

Seat No.	

M.Sc. (Physics-Applied Electronics) (Semester – IV) (Old) (CGPA) Examination, 2017
COMPUTATIONAL METHODS AND PROGRAMMING.

Day & Date: Friday, 21-04-2017 Max. Marks: 70

Time: 02.30 PM to 05.00 PM

N.B. : *1) Q.**1** andQ.**2** are **compulsory.***
*2) Answer any **Three** questions from Q. No. 3 to Q. No.7.*
*3) Use of **Non Program able** Calculator is allowed.*
*4) All question carry **equal** marks.*

Q.1 A) Choose the correct alternative. **06**

1) For solving set of equation AX = B, in which method, coefficient matrix A is transformed to Diagonal matrix.
   a) Gauss-Seidal method b) Gauss elimination method
   c) Gauss Jordan method d) Gauss Jacobi's method

2) In solving a set of simultaneous ordinary differential equations by 4th order Runge kutta method, if $y(0) = 0, h = 0.1$, k_1= 0.2, k_2=0.2150, k_3=0.2171 and k_4= 0.2359 then value of $y(0.1) =$?
   a) 0.2066 b) 0.1618
   c) 0.2166 d) 0.3616

3) Using the principle of least square, first normal equation of the curve $y = be^{ax}$ will be
   a) $\Sigma \log y$= n$\Sigma \log b$+$b\Sigma \log x$ b) $\Sigma\, y$= $n\,\Sigma$ b + a $\log x$
   c) $\Sigma\, y = n\,\Sigma\, b$+$a\,\Sigma \log x$ d) $\Sigma \log y = n\,\Sigma \log b + a\,\Sigma\, x$

4) Gauss Seidal method converges only, if the coeffcient matrix is
   a) Singular matrix b) Non singular matrix
   c) Diagonally dominant d) Upper triangular matrix

5) Using Bisection method the (n)th approximation formula for the real root of the equation $f(x) = 0$ is given by …
   a) $\frac{xn+x_n-1}{3}$ b) $\frac{x_{n-1+x_{n-2}}}{2}$
   c) $\frac{x_{n-x_{n-1}}}{2}$ d) $\frac{x_{n-1+x_{n-3}}}{3}$

6) Milne method is used
   a) To solve ordinary D.E.
   b) To find out the root of algebraic equation
   c) To evaluate integration.
   d) None of these

B) State true or false. **08**

1) The Principle of least square is based on Maximizing the ΣE_i,

where $\mathrm{E}i = (y_i - y)^2$.

2) The positive real root of the equation $5x^3 - 3x - 1 = 0$ lies between 0 and 1. Subpart To predict Adam's Method at least 4 value of γ, prior to the desired values are required.
3) In Newton's Cotes formula if $f(x)$is interpolated at equally spaced nodes by a polynomial of degree two then it represents three eight rule.
4) To fit the straight line $\gamma = c + xa$ to *N* observations, the normal equations are $\Sigma y = a\Sigma\,\mathrm{x} + \mathrm{cN}; \Sigma xy = a\Sigma x^2 + \mathrm{c}\,\Sigma\,\mathrm{x}$.
5) The value of $I = \int_0^{0.5} x\,dx$ by Simpson's $1/3^{rd}$ rule is 0.125
6) Gauss Jordan method for solving the system *AX=B f*ails if matrix A is diagonally dominant.
7) Gauss Elimination is an direct method.
8) Newton Raphson Method fails when $f^1(a)=0$

Q.2 Write short notes on:

a) Write a note on Quadratures and explain how to arrive at Simpson's three eighth rule. **05**

b) What are random walks explain its use. **04**

c) Write a note need of numerical solution of the differential equations. **05**

Q.3 a) Write a note on Newton Raphson Method. Find a positive root of $\gamma \sin y = -\cos y$ by False Position Method. **08**

b) Using improved Euler Method find $\gamma\ at\ x = 0.1, and\ y\ at\ x = 0.2$, given $0.5\frac{dy}{dx} = y - \frac{x}{y}$ with $y(0) = 1$. **06**

Q.4 a) Evaluate the integral I= $\int_0^2 \frac{dx}{x^{2+x+1}}$ by 'Simpsons one third rule by dividing interval in eight parts. **06**

b) Find the value of $y(0.615)$ for the following data. **08**

x	0.61	0.62	0.63	0.64	0.65	0.66	0.67
y	1.840431	1.858928	1.877610	1.896481	1.915541	1.934792	1.954237

Q.5 a) The curve $\gamma = cd^x$ is fitted to the data **08**

X:	2	3	4	5	6	8
Y:	8.3	15.4	33.1	65.2	126.4	146

Find the best value of c and d.

b) Solve the system of equation by Gauss-Jordan method. **06**

$10x - 7y + 3z = 6$
$-6x + 8y - z = 5$
$3x + 8 + 4z = 2$

Q.6 a) Perform four iterations of false position method to find the positive root of the equation $x \tan x = 1$ by taking $x_0 = 2.5$ and $x_1 = 3$ **08**

b) Solve the following system of equation by Gauss Seidal method **08**

$28x + 4y - z = 32$
$2x + 17y + 4z = 35$
$x + 3y + 10z = 24$

Q.7 a) Evaluate $\int_0^{0.8} e^{-y^2}\,dy$ using Romberg's Method. **08**

b) Given $\frac{dy}{dx} = \frac{1}{2}(1 + x^2)y^2$ and $y(0) = 1, y(0.1) = 1.06, y(0.2) = 1.12, y(0.3) = 1.21$, find $y(0.4)$ by Milne's Predictor Corrector Method. **06**

SLR-RO 724

Seat No.	

M.Sc. – I (Semester – II) (CBCS) Examination, 2017
PHYSICS
MICROELECTRONICS

Day & Date: Saturday, 22-04-2017 Max. Marks: 70

Time: 02.30 AM to 05.00 PM

Instruction : *1) Question 1 and 2 are compulsory*
2) Attempt any Three from Q.3 to Q.7
3) Use of non-programmable calculator is allowed
4) All questions carry equal marks.

Q.1 A) Choose the correct answer **6**

1) In Czochralski crystal growth process, the material are heated up to
   a) 950^0c b) 1420^0c c) 1000^0c b) 1200^0c

2) The coating material used for the photo etching process along with its thickness is,
   a) Kodak photoresist (5000-10000Å)
   b) Kodak photo etchant (1000-5000 Å)
   c) Kodak photoresist (1000-5000 Å)
   d) Kodak photo etchant (500-1000 Å)

3) An example of for deep UV photo resist is,
   a) Poly-Methyl methacrylate (PMMA) b) Sodium Hydeoxide
   c) Ammonium Hydroxide d) Potessium Chloride

4) The density of silicon atoms in the silicon crystal is,
   a) $5x10^{22}$ atoms/cm^3 b) $5x10^{-22}$atoms/ cm^3
   c) $5x10^{22}$ atoms/ m^3 d) none of these

5) The standard Ficks law of diffusion is given by,
   a) j = -D * ∂C(x,t) b) j = -D $\frac{\partial C(x,t)}{\partial x}$
   c) j = -$\frac{\partial C(x,t)}{\partial x}$ d) none of the mentioned

6) The CMOS process has the advantage over NMOS because
   a) Low power dissipation b) Minimum sensitivity to the load
   c) High packing density d) All of the mentioned

B) State True or False **8**

1) In the Silicon crystal structure, the defects shall not cause any influence the optical, electrical and mechanism properties.
2) Oxidation provides extreme hard protective coating, thus protecting against contamination.
3) In ion implantation technique, accelerating, potential and the beam current are electrically controlled from outside.
4) GaAs belongs to the III – IV compound semiconductors and are suitable for opto=electronic devices and high =-speed ICs
5) Aluminum forms low resistance and therefore, it is suitable material for the ohmic contact especially for p-type silicon and heavily doped n-type silicon
6) Boron is a n- type material, whereas Phosphorous is an p-type material
7) The maximum lead available in a metal can IC package is 12.
8) NMOS technology is preferred more than PMOS technology

Q.2 Write short notes on: **14**

a) The environment for the VLSI technology
b) Growth kinetics of the epitaxial process
c) Characteristics of the good – resist

Q.3 **A)** List Epitaxial defects and discuss any one in detail **06**
B) With neat sketch, describe the MBE technique in detail. **08**

Q.4 **A)** Write a note on optical lithography technique **06**
B) Write necessary theory discuss the diffusion mechanism in detail. **08**

Q.5 **A)** Discuss Molecular Beam Epitaxy technique with a neat sketch. **06**
B) Discuss Chemical vapour deposition technique for the deposition of Poly silicon films **08**

Q.6 **A)** Write a note on buried layers **06**
B) With a neat schematic, explain the DC magnetron sputtering technique **08**

Q.7 **A)** Write a note on Electron beam Lithography **06**
B) Write relevant diagrams, explain the masking sequence and process flow for pnp and npn devices, **08**

Seat No.	

M.Sc. Physics (Applied Electronics) (Semester – IV) (Old)
(CGPA) Examination, 2017
MICROWAVE ENGINEERING

Day & Date: Monday, 24-04-2017 Max. Marks: 70

Time: 02.30 PM to 05.00 PM

N.B. : *1) Questions **NO.1** and **2** are **Compulsory.***
*2) Answer **any three** from **Q.NO.3** to **Q.NO.7***
4) All question carry equal marks.

Q.1 Choose the correct alternative: **06**

A) 1) Electric field only is transverse to the direction of propagation and magnetic field in not transverse is indicated by ____
a) TE waves b) TE waves
c) TEM waves d) HE waves

2) The wavelength of an electromagnetic wave in a waveguide is _____
a) Less than in free space
b) Greater than in free space
c) Inversely proportional to the phase velocity
d) Directly proportional to the group velocity

3) In a perfect dielectric, wave propagation occurs.
a) With zero attenuation b) With small attenuation
c) With large attenuation d) With infinite attenuation

4) The reflex Klystron is a ____
a) Single cavity Klystron b) Two cavity Klystron
c) Transit time d) None of the above

5) In a phase shifter, change in phase can be obtained with the help of _____
a) Vacuum b) Conductor
c) Dielectric d) None of the above

6) Reflection of microwaves cannot be observed from
a) Short circuit b) Matched load
c) Open circuit d) Any other load

B) State True or False/ Fill in the blanks: **08**

1) The knowledge of planer wave propagation is very importance to understand the propagation of microwaves.
2) TWT is used a broadband amplifier in microwave applications.
3) The solution of Maxwell's equation involves three space

variables in addition to the time variable.

4) The quality factor Q of a microstrip lines is very high which may be required for high quality resonant MICS.
5) The impedance matching is very desirable in transmission lines.
6) The passive elements used to control the amount of microwave power in a transmission line are called as isolators.
7) In a two-cavity klystron, the cavity close to the cathode is known as the buncher cavity.
8) In wave polarization, the orientation of magnetic filed changes.

Q.2 Write a short note on following:

1) Velocity modulation **05**
2) Matched loads **05**
3) TE and TM waves **04**

Q.3 1) Starting from Maxwell's equations derive the wave equation. **10**
2) Give an account on boundary conditions. **04**

Q.4 1) Explain the construction and working of multicavity klystron. **10**
2) Explain the advantages of waveguides. **04**

Q.5 1) Discuss with relevant diagram, the construction and working of waveguide phase shifters. **08**
2) Explain the advantages of waveguides. **06**

Q.6 1) Derive equations for losses on coaxial lines. **10**
2) What are striplines? Explain. **04**

Q.7 1) Discuss coaxial and strip line attenuators. **08**
2) Write a note on adjustable short circuits. **06**

Seat No.	

M.Sc. Physics (Applied Electronics) (Semester – IV) (Old) (CGPA) Examination, 2017
MICROPROCESSORS AND INTERFACING

Day & Date: Saturday, 29-04-2017 Max. Marks: 70

Time: 02.30 PM to 05.00 PM

Instructions : *1)* ***Q.1 and Q.2 are compulsory.***
2) Solve any ***three*** *questions from* ***Q.3 to Q.7.***
3) Figures to ***right*** *indicate* ***full marks.***

Q.1 a) Choose the correct option: **08**

1) After reset the contents of program counter (PC) are.
   a) 0000H b) FFFFH c) Undefined d) None of these

2) Which of the following interrupt is only edge triggered?
   a) TRAP b) RST7.5 c) RST6.5 d) RST5.5

3) How many software interrupts are available in 8085.
   a) 4 b) 5 c) 3 d) 8

4) If an address of Port C of 8255 is 82H then the Port- A address is.
   a) 80H b) 81H c) 83H d) None of these

5) In I/O mapped I/O; address width is _____.
   a) 64 bit b) 32 bit c) 16 bit d) 8 bit

6) ADC0808 is of _____ type.
   a) Weighted register b) Successive approximation
   c) Flash d) R-2R ladder resistor

7) Ten address lines can be addressed up to _____.
   a) 16K b) 4K c) 1K d) 16K

8) When the Ready pin of 8085 has active low input then the microprocessor goes to _____ state.
   a) Reset b) Halt c) Wait d) Hold

	b)	**State True or False:** 1) 8255 is known as programmable peripheral interface device. 2) There are 8 software interrupts in 8085. 3) RAM is a non volatile memory. 4) Only Port C available in the BSR (Bit Set Reset) mode. 5) 8279 drives keyboard as well as display. 6) ADC 0809 is of flash type.	**06**
Q.2	**a)**	Explain the data transfer in memory mapped I/O.	**05**
	b)	Explain the BSR mode of 8255.	**05**
	c)	Explain the ROM memory.	**04**
Q.3	**a)**	Interface 4K x 8 RAM 8085. Determine its initial and final address.	**08**
	b)	Explain the software interrupts of 8085.	**06**
Q.4	**a)**	Draw and explain the block diagram of programmable interval timer 8253.	**08**
	b)	Explain the features of 8279.	**06**
Q.5	**a)**	What are the different I/O modes of 8255? Explain any one mode of 8255.	**08**
	b)	Explain the features of programmable interrupt controller 8259.	**06**
Q.6	**a)**	Interface ADC 0809 to 8085 in I/O mapped I/O.	**08**
	b)	Explain weighted resistor type of DAC.	**06**
Q.7	**a)**	Interface peripheral interface 8255 to 8085 in I/O mapped I/O.	**08**
	b)	Explain the address decoding logic used in the memory interfacing.	**06**

SLR-RO – 727

Seat No.	

M. Sc. (Physics – Applied Electronics) (Semester – IV) (New) (CBCS) Examination, 2017
MICROELECTRONICS

Day & Date: Wednesday, 19-04-2017 Max. Marks: 70

Time: 2::30 PM to 05.00 PM

N.B. : *1)* ***Q.1*** *and* ***Q2*** *are* ***compulsory.***
2) ***Attempt*** *any Three from* ***Q .No 3*** *to* ***No.7***
3) Use of non-programable calculator is allowed
4) All questions carry equal marks

Q.1 A) Choose the correct alternatives: **06**

1) Crystalline Si has
   a) Four valence electrons per atom
   b) Two valence electrons per atom
   c) Eight valence electrons per atom
   d) No valence electrons

2) Oxidation process in Silicon planar technology is also called as,
   a) Photo Oxidation b) Vapour Oxidation
   c) Silicon Oxidation d) Thermal Oxidation

3) The advantage of using Ion implantation process is
   a) Due to lateral spreading is more
   b) Beam current can be controlled
   c) Its high temperature performance
   d) Its performance at low temperature

4) The chemical reaction for the oxidation process
   a) $Si + 2H_2O -> SiO_2 + 2H_2$
   b) $Si + O_2 -> SiO_2$
   c) $2Si+2H_2O -> 2SiO_2+2H_2$
   d) $2Si+2H_2O+2O_2 -> 2SiO_2+2H_2+O_2$

5) Plasma etching is an example for,
   a) Dry etching b) Wet etching
   c) Both dry and wet etching d) None of the mentioned

6) In the context of IC fabrication, metallization means,
   a) Connecting the metallic wires
   b) Depositing SiO_2 layer

c) Forming interconnecting conduction and bonding pads
d) Covering with metallic cap

B) State whether true or false. **08**

a) Miller indices are used to designate planes and directions within a crystalline lattice.
b) During IC fabrication, Silicon wafers are usually cut along a {100} plane with a flat or notch to orient the wafer
c) In MOS capacitor, the preference in dielectric layer is given to Silicon Nitride (Si_3N_4)
d) The value of collector series resistance of an integrated transistor can be easily reduced by a process known as "buried layer" or "Buried n^+ layer".
e) During ion implantation, the accelerated ions are passed through Strong Electric field
f) The process of film deposition in cathode sputtering is very much faster than evaporation method.
g) GaAs is easy to grow in crystal form compared to Si.
h) Metallization process takes place in vacuum evaporation chamber, where the material is evaporated by focusing a high power density electron beam.

Q.2. Write short notes on the following:

a) Clean room and safety requirements for the device fabrication **05**
b) Masking characteristics **04**
c) Die separation **05**

Q.3
a) Discuss Dry chemical etching technique **06**
b) With a neat sketch, explain the Molecular Beam Epitaxy process **08**

Q.4
a) Discuss the Phosphorous diffusion technique in detail. **06**
b) With a suitable example and relevant sketches, explain the positive and negative photo resist patterning process **08**

Q.5
a) Discuss electron beam lithography technique with a neat sketch **06**
b) Discuss Chemical vapour deposition technique for the deposition of silicon dioxide films **08**

Q.6
a) Write a note on the multilevel metallization schemes **06**
b) With a neat schematic, explain the DC sputtering technique **08**

Q.7
a) Write a note on bonding and attachments **06**
b) With relevant diagrams, explain the masking sequence and process flow of n-MOS device **08**

Seat No.	

M.Sc. Physics (Applied Electro.)(Sem IV) (New)(CBCS) Examination, 2017
Microwave Devices And Circuits

Day & Date: Monday, 24-04-2017 Max. Marks: 70

Time: 02.30 PM to 05.00 PM

N.B. : *1) Q.(1) & Q. (2) are compulsory.*
2) Answer any three questions from Q.(3) to Q. (7).
3) All questions carry equal marks.

Q.1 Objectives questions.

A) Select correct alternatives. **06**

1) The microwave frequency range of X-band is
   a) 4 to 6 GHz b) 6 to 8 GHz
   c) 8 to 12 GHz d) 12 to 18 GHz

2) Polarization of an EM wave is taken as the
   a) Direction of the H-field.
   b) Direction of the E-field.
   c) Normal to the direction of H-field.
   d) Normal to the direction of E-field.

3) In Gunn diode, the current density decreases with increase in electric field is called as
   a) Positive differential resistivity
   b) Negative differential resistivity
   c) Differential conductivity
   d) None of the above

4) The time taken by the electron to travel into the repeller space and back to the gap is called as
   a) Aperture effect b) Repeller voltage
   c) Transit time d) None of the above

5) The passive elements used to limit microwave power in transmission line are called as
   a) Isolators b) Attenuators
   c) Phase shifters d) None of the above

6) In a rectangular waveguide, the following waves can exist
   a) TE waves only b) TEM waves only
   c) TM waves only d) Both TE and TM waves

B) State true or false. **08**

1) The electric and magnetic wave equations are derived from Maxwell's equations.
2) The wave in the TWT is a propagating wave.
3) A line terminated in its characteristics impedance has a standing

wave ratio of unity.

4) The EM wave inside a waveguide can have an infinite number of patterns called modes.
5) The effect of velocity modulation produces bunching of the electron beam.
6) The reflex klystron overcomes the disadvantages of the two-cavity klystron.
7) A microstrip line is called as open-strip line.
8) In wave polarization, the orientation of electric field changes.

Q.2 Write short notes. **14**

1) Wave polarization
2) Types of microwave cavities
3) Coaxial and strip line shifters

Q.3 **A)** Derive an expression for the cut off frequency for the TE waves in a rectangular wave guide. **08**

B) Derive an expression for velocity modulation in klystrons. **06**

Q.4 **A)** Draw the relevant diagram & explain the construction and functioning of a reflex klystron. **10**

B) State the Maxwell's equations in both differential and integral forms. **04**

Q.5 **A)** Discuss with relevant diagram, the construction and working of waveguide attenuators. **08**

B) Give a detailed account on waveguide terminations. **06**

Q.6 **A)** Derive equations for losses on coaxial lines. **10**

B) Explain the necessity of impedance matching. **04**

Q.7 **A)** With neat diagram, explain the construction and working of waveguide attenuators. **08**

B) Discuss the various microwave tubes. **06**

SLR-RO –729

Seat No.	

M.Sc. Physics(Applied Electronics) (Semester – IV) (New) (CBCS) Examination, 2017
FIBER OPTIC COMMUNICATIONS

Day & Date: Friday, 21-04-2017 Max. Marks: 70

Time: 02.30 PM to 05.00 PM

N.B. : *1) Q.**1** andQ.**2** are **compulsory.***
2)Answer any three questions from Q.3 to Q.7
3) All question carry equal marks.

Q.1 Objective Questions. **14**

A) Select correct alternatives. **06**

1) The total number of guided modes for a step index fiber is approximately given by expression, where V is normalized frequency as
   a) $\mathrm{M} = V^2/2$ b) $\mathrm{M} = V^2/3$
   c) $\mathrm{M} = V/2$ d) $\mathrm{M} = V^2/4$

2) Laser is _____ optical source
   a) Non-coherent b) Coherent
   c) Both a) and B) d) None of these

3) To achieve optical amplification the condition N2>N1 (density of atoms in energy levels E1 and E2) known as ____
   a) Population inversion b) Polarization
   c) Attenuation d) amplification

4) Multipath dispersion does not exist in a
   a) Single mode fiber b) Multi-mode fiber
   c) Plastic optical fiber d) Low loss fiber

5) Numerical aperture of an optical fiber represents
   a) The cone outside which the light is incident on fiber end
   b) The cone within which the light is incident on fiber end
   c) Whether a fiber is single mode or not
   d) The phase changes of propagating light

6) A step index multimode fiber with N.A.=0.2 supports approximately 1000 modes at 850 nm wavelength. What is core diameter?
   a) 15.20 um b) 30.25 um
   c) 40.80 um d) 60.50 um

B) State True or False: **08**

1. Meridional ray is the which passes through axis of fiber core.
2. Multimode graded index fibers exhibit for less intermodal

dispersion than multimode step index fibers due to their Multipath reflection.

3. The requirement of detector is high fidelity only.
4. The Dome LED has higher external power efficiency than the planar LED.
5. The refractive index profile of the fiber core plays an important role in characterizing the properties of optical fibers.
6. The LASER provides optical emission without an inherent gain mechanism
7. Microscopic meandering of the fiber core axis is known as Bending.
8. A quantum efficiency of 75% is equivalent to 100 electrons collected per 75 incident photons.

Q.2 Write Short notes: **14**

1) Principle of p-i-n photodiode. **05**
2) Optical couplers **05**
3) Fluoride glass fibers **04**

Q.3 A) Explain a typical experimental arrangement for the measurement of spectral loss in optical fiber using the cut book technique. **08**

B) Explain the structure of surface emitting LED. **06**

Q.4 A) An 8 km optical fiber link without repeaters uses multimode graded index fiber which has a bandwidth length product of 400 MhzKm. Estimate.

1. The total pulse broadening on the link. **08**
2. The rms pulse broadening on the link.

B) Compare dispersion in different types of optical fibers. **06**

Q.5 A) P-n photodiode has aquqntum efficiency of 50% at the wavelength of 0.9μm. Calculate:

1) Its responsively at 0.9 μm.
2) The received optical power if the mean photocurrent is 10^{-6}A
3) The corresponding number of received photons at this wavelength. **08**

B) Explain advantages of Fiber optic communication. **06**

Q.6 A) The longitudinal modes of a gallium arsenide injection laser emitting at a wavelength of 0.87 μm are separated in frequency by 278GHz. Determine the length of the optical cavity and the number of longitudinal modes emitted. The refractive index of gallium arsenide is 3.6 **08**

B) Explain working principle and characteristics of injection LASER. **06**

Q.7 A) Explain the experimental setup for the near field scanning measurement of the refractive index profile. **08**

B) List the important performance and compatibility requirements for optical detectors. **06**

Seat No.	

M.Sc. Physics (Applied Electronics) (Semester – IV) (New) (CBCS) Examination, 2017
MICROPROCESSORS AND INTERFACTING

Day & Date: Saturday, 29-04-2017 Max. Marks: 70

Time:02.30 PM to 05.00 PM

N.B. : 1) Q.(1) & Q. (2) are compulsory.
2) Answer any three questions form Q.(3) to Q. (7).
3) Figures to right indicate full marks.

Q.1 A) Select correct alternatives. **08**

1) In memory-mapped scheme, the devices are viewed as

a) Distinct I/O devices b) Memory locations
c) Only input devices d) Only output devices

2) The feature of mode 0 of 8255 is
a) Any port can used as input or output
b) Output ports are latched
c) Maximum of 4 ports are available
d) All of the mentioned

3) The feature of mode 2 of 8255 is
a) Single 8-bit port is available
b) Both inputs and outputs are latched
c) Port C is used for generating handshake signals
d) All of the mentioned

4) The number of counters that are present in the programmable timer device 8253 is
a) 1 b) 2 c) 3 d) 4

5) The operation that can be performed on control word register is
a) Read operation b) Write operation
c) Read and write operations d) None of the above

6) The mode of 8253 that is used to interrupt the processor by setting a suitable terminal count is
a) Mode 0 b) Mode 1 c) Mode 2 d) Mode 3

7) The PIC 8259 can handle _____maximum interrupts when it is used in Master and Slave mode
a) 8 b) 16 c) 32 d) 64

8) The ADC0809 is _____type
a) R-2R Ladder b) Weighted resistor
c) Flash d) Successive Approximation

B) State true or false. **06**

1) BSR mode of 8255 operates on PORTC only.
2) For ADC0809 the status signal EOC (End of Conversion) is input signal.
3) Mode 3 of 8253 is Rate / Pulse generator.
4) To interface 1K of RAM to 8085 the 10 address lines are required.
5) 8255 is called as Programmable Peripheral Interface device.
6) In I / O mapped I / O to read the device the instruction used is IN 8 bit address.

Q.2 **A)** Differentiate between I/ O mapped I / O and Memory mapped I / O. **05**
B) Explain the square wave generation mode of 8253. **05**
C) Explain the features of 8255. **04**

Q.3 **A)** Interface 2K x 8 RAM to 8085. Determine its initial and final address. **08**
B) Explain the BSR mode of 8255. **06**

Q.4 **A)** Interface DAC to 8085 through 8255. Write assembly language program to generate a square wave of 50% duty cycle. **08**
B) With the help of suitable circuit diagram explain R-2R type DAC. **06**

Q.5 **A)** Draw and explain the block diagram of 8253. **08**
B) With neat diagram explain the successive approximation type ADC. **06**

Q.6 **A)** Interface the 8255 to 8085 in memory mapped I / O. Determine the addresses of all ports. **08**
B) Explain any two ICW's (Initialization Command Words) of PIC8259. **06**

Q.7 **A)** Interface the keyboard and display driver 8279 to 8085. **08**
B) Explain the salient features of 8279. **06**