SLR-UR-558

Seat No.	

Set P

M.Sc. (Semester - I) (CBCS) Examination Mar/Apr-2018
Physics (Applied Electronics)
MATHEMATICAL TECHNIQUES

Time: 2½ Hours Max. Marks: 70

Instructions: 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) Select correct alternatives: **06**

1) Consider a counterclockwise circular contour $|z| = 1$ about the origin. The integral $\oint f(z)dz$ over this contour is _____.
   a) $-i\pi$ b) zero
   c) $i\pi$ d) $2i\pi$

2) Two matrices A and B are said to be similar if $B = P^{-1}AP$ for some invertible matrix P. Which of the following statements is Not TRUE?
   a) Det A = Det B
   b) Trace of A = Trace of B
   c) A and B have the same eigenvectors
   d) A and B have the same eigenvalues

3) The solutions to the differential equation $\frac{dy}{dx} = -\frac{x}{y+1}$ are a family of ___.
   a) circles with different radii
   b) circles with different centres
   c) straight lines with different slopes
   d) straight lines with different intercepts on the y-axis

4) A periodic function $f(x)$ of period 2π is defined in $[-\pi, \pi]$ as $f(x) = \begin{cases} -1, -\pi < x < 0 \\ +1, 0 < x < \pi \end{cases}$. The appropriate Fourier series expansion for $f(x)$ is _____.
   a) $f(x) = (4/\pi)[\sin x + \frac{\sin 3x}{3} + \frac{\sin 5x}{5} + \cdots]$
   b) $f(x) = (4/\pi)\left[\sin x - \frac{\sin 3x}{3} + \frac{\sin 5x}{5} - \cdots\right]$
   c) $f(x) = (4/\pi)[\cos x + \frac{\cos 3x}{3} + \frac{\cos 5x}{5} + \cdots]$
   d) $f(x) = (4/\pi)[\cos x - \frac{\cos 3x}{3} + \frac{\cos 5x}{5} - \cdots]$

5) The Fourier transform of the derivative of the Dirac δ-function, namely $\delta'(x)$, is proportional to _____.
   a) 0 b) 1
   c) Sink d) ik

6) The inverse Laplace transform of $f(s) = \frac{1}{s^2(s+1)}$ is _____
   a) $\frac{1}{2}t^2e^{-t}$ b) $\frac{1}{2}t^2 + 1 - e^{-t}$
   c) $t - 1 + e^{-t}$ d) $\frac{1}{2}t^2(1 - e^{-t})$

B) State True or False **08**

1) The operator, $\frac{\mathrm{d}^2}{\mathrm{dx}^2}$ is not Hermitian.
2) The eigenvalues of the matrix $\begin{pmatrix}0 & 1 & 0\\ 1 & 0 & 1\\ 0 & 1 & 0\end{pmatrix}$ are 0, 1, 1.
3) The $(z)^2$ is an analytic function of z everywhere in the complex plane.
4) The value of $(-i)^{(-i)}$ is $e^{\pi/2}$
5) A "periodic function" is given by a function which has a period T = π.
6) A Laplace transform exists when the function is of differential order.
7) The solution of the differential equation $\frac{dx}{dt} - x^2 = 0$ with initial condition $x(0) = 1$ will blow up as t tends to infinity.
8) A periodic function $f(x)$ of period 2π is not defined in the interval $[-\pi, \pi]$.

Q.2 Short answer type questions:

a) State and explain Cauchy-Riemann conditions. **05**

b) Find the inverse of the matrix, $A = \begin{pmatrix}1 & 3 & 3\\ 1 & 4 & 3\\ 1 & 3 & 4\end{pmatrix}$ **05**

c) Obtain the independent solutions of the differential equation, **04**

$$\frac{d^2y}{dx^2} - 3\frac{dy}{dx} + 2y = 0$$

Q.3 **a)** Use residues and evaluate the definite integral, $\int_{-\pi}^{\pi} \frac{\mathrm{d}\theta}{1+\sin^2\theta}$ **08**

b) Find the eigenvalues and eigenvectors of $\mathrm{H} = \begin{pmatrix}0 & 0 & 1\\ 0 & 1 & 0\\ 1 & 0 & 0\end{pmatrix}$ **06**

Q.4 **a)** Using Fourier series in $[-\pi, \pi]$, analyze the square wave in terms of it's Fourier components. **08**

b) Fourier series which will represents $\mathrm{f}(\mathrm{x}) = x \sin x$ in the interval $[-\pi, \pi]$ then prove that, $\frac{\pi}{4} = \frac{1}{2} + \frac{1}{3} - \frac{1}{15} + \frac{1}{35} - \cdots$ **06**

Q.5 **a)** Using the Fourier transform, solve the one-dimensional equation for transverse wave as $\frac{\partial^2\varphi(x,t)}{\partial x^2} - \frac{1}{\vartheta^2}\frac{\partial^2\varphi(x,t)}{\partial t^2} = 0$ **08**

With conditions $\varphi(x,t) \to 0 \; and \; \frac{\partial\varphi}{\partial x} \to 0$ (as $x \to \pm\infty$)

$$\varphi(x,0) = F(x) \text{ and } \frac{\partial\varphi}{\partial t}\Big|_{t=0}^{=0}$$

b) Find the Fourier transform for the box function $\mathrm{f}(\mathrm{x})$ where $f(x) = \begin{cases}1, & (-a \le x \le a)\\ 0 & (|x| > a)\end{cases}$ sketch $\mathrm{f}(\mathrm{x})$ and it's Fourier transform. **06**

Q.6 **a)** Solve $\frac{d^2y}{dx^2} - 2\frac{dy}{dx} + y = x.\sin x$ **08**

b) Let $X_1(t)$ and $X_2(t)$ be two linearly independent solutions of the differential equation, $\frac{d^2x}{dt^2} + 2\frac{dx}{dt} + f(t)x = 0$ and **06**

$let\ W(t) = x_1(t)\frac{dx_2(t)}{dt} - x_2(t)\frac{dx_1(t)}{dt}.\ if\ W(0) = 1$ then find W(1)

Q.7 **a)** Evaluate $\int \frac{(z-1)}{c\,(z+1)^2\,(z-2)}dz$, where C is $|z - i| = 2$ **08**

b) Using Laplace transform, show that $\int_0^{\infty} \frac{\sin \mathrm{tx}}{\mathrm{x}}\mathrm{dx} = \frac{\Pi}{2}\ (\mathrm{t} > 0)$ **06**

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Seat No.	

Set P

M.Sc. (Semester - I) (CBCS) Examination Mar/Apr-2018
Physics (Applied Electronics)
CONDENSED MATTER PHYSICS

Time: 2½ Hours Max. Marks: 70

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

Q.1 A) Objectives questions: **06**

1) Miller indices of crystal plane which intercepts at (2a, 3b, c) are _____.
   a) (3, 3, 6) b) (1, 2, 3)
   c) (2, 1, 6) d) (3, 2, 6)

2) Bloch function is _____
   a) $\varphi_r(k) = u_r(k)\exp(ik.r)$ b) $\varphi_k(r) = u_r(k)\exp(ik)$
   c) $\varphi_k(r) = u_k(r)\exp(ik.r)$ d) $\varphi_k(r) = u_k(r)\exp(ik)$

3) p-type semiconductor is formed by adding _____ impurity.
   a) Bivalent b) Trivalent
   c) Tetravalent d) Pentavalent

4) Induced electric dipole moment is directly proportional to _____.
   a) E b) E^2
   c) E^3 d) $E^{1/2}$

5) Superconductor is _____ below critical temperature.
   a) Diamagnetic b) Paramagnetic
   c) Ferromagnetic d) Antiferromagnetic

6) Coordination number of body centred cubic crystal structure is _____.
   a) 6 b) 8
   c) 10 d) 12

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

1) Complex dielectric constant of non-polar solids does not depend on the complex polarisabilities. (True/False)
2) Superconductor has some flux density in presence of applied magnetic field.
3) Diamond is a conductor.
4) Crystalline solids are anisotropic.
5) A superconducting material has a critical temperature of 7.26 K at zero magnetic field and a critical field of 8×10^5 A/m at 0K. Then critical field at 5K is 4.2×10^5 A/m.
6) Relation between electronic polarisability and induced electric dipole moment is given by $\boldsymbol{\mu_{e=}\alpha_e \cdot E}$.
7) Induced electric dipole moment is inversely proportional to electric field E.
8) NaCl shows orientation polarization.

Q.2	**Write short notes:**		**14**
	a)	Explain Type I and II superconductors.	**05**
	b)	Define Dielectric polarization. Give an expression for electronic polarizability.	**05**
	c)	Define 1) Cooper pair 2) Critical temperature 3) Critical current 4) Type I and II superconductor	**04**
Q.3	**a)**	Define penetration depth. Give a relation between penetration depth and temperature.	**08**
	b)	Explain the concept of Brillouin zones.	**06**
Q.4	**a)**	Explain the extended, reduced and periodic zone schemes. Plot energy (E) as a function of wave vector (k) for one dimensional lattice in above three zone schemes.	**08**
	b)	Explain electronic, ionic and orientational polarisabilities.	**06**
Q.5	**a)**	What is meant by imperfections in crystals? Explain the various defects in the crystal.	**08**
	b)	Discuss the Meissner effect in detail.	**06**
Q.6	**a)**	Obtain a solution of wave function of an electron in periodic potential.	**08**
	b)	Explain the extended, reduced and periodic zone schemes.	**06**
Q.7	**a)**	Discuss the BCS theory in details.	**08**
	b)	Differentiate between polycrystalline, nanocrystalline and amorphous materials.	**06**

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Set P

M.Sc. (Semester - I) (CBCS) Examination Mar/Apr-2018
Physics (Applied Electronics)
ANALOG & DIGITAL ELECTRONICS

Time: 2½ Hours Max. Marks: 70

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

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

1) In 8085, memory read cycle is _____ stated.
   a) 3 b) 4
   c) 5 d) 6

2) The output impedance of opamp is decreases due to _____ feedback.
   a) Negative b) Positive
   c) Negative + Positive d) None on these

3) IC 741 Opamp has slew rate of _____ m $V/°C$.
   a) 0.6 b) 0.5
   c) 0.3 d) 0.4

4) The _____ gates are mainly used for checking parity of data.
   a) NOR b) NAND
   c) EX-OR d) EX-NOR

5) The _____ gate has two or more input signals but only one output signals.
   a) OR b) AND
   c) XOR d) XNOR

6) Decade counter requires _____ number of flip flops.
   a) 3 b) 5
   c) 4 d) 2

7) In microprocessors symbolic address is recorded in the _____ field.
   a) Label b) Opcode
   c) Operand d) Comment

8) In 8085, _____ signal is used to demultiplex address/ data bus.
   a) RD b) WR
   c) ALE d) INTR

B) Fill in the blanks / State true or false:- **06**

1) In JK flip flop race around condition arises due to _____.
2) The sawtooth waveform has a rise time many times than the fall time
3) _____ feedback is used in oscillator circuits.
4) In the oscillator circuit the total phase shift of the loop gain must be _____.
5) A demultiplexer is used to perform _____ conversion.
6) An ideal operational amplifier has zero output impedance.

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

a) Addressing modes of 8085 microprocessor
b) Op Amp as an Integrator
c) Adjustable voltage regulators

Q.3 **a)** Explain non inverting configuration of 3 input Op Amp as a summing, scaling and averaging amplifier. **08**

b) Explain effect of negative feedback on output resistance of Op Amp. **06**

Q.4 **a)** What is Oscillator? Describe phase shift oscillator, obtain an expression for frequency of oscillation. **08**

b) Design a phase shift oscillator for f_0 = 1 KHz, using IC741. **06**
(Supply Voltage = $\pm$15V)

Q.5 **a)** Draw and explain function block diagram of Intel 8085 microprocessor. **08**

b) Explain demultiplexing of AD0- AD7 signals. **06**

Q.6 **a)** What is shift register? Draw and explain logic diagram of PIPO shift register. **08**

b) Draw and explain 16:1 multiplexer using AND gate. **06**

Q.7 **a)** Write an ALP for addition of two 8 bit numbers using Direct addressing mode. **08**

b) Reduce the following logical expressions using Boolean laws: **06**
$\overline{A}BC + AB\overline{C} + ABC + \overline{A}B$
Draw logic diagram of reduced expression

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Seat No.	

Set P

M.Sc. (Semester - I) (CBCS) Examination Mar/Apr-2018
Physics (Applied Electronics)
CLASSICAL MECHANICS

Time: 2½ Hours Max. Marks: 70

Instructions: 1) Attempt in all five questions.
2) Q.1 and Q.2 are compulsory.
3) Attempt any three questions from Q. 3 to 7.
4) Figures to the right indicate full marks.

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

1) The Lagrangian of the system gives _____ of the system.
   a) difference in kinetic and potential energy
   b) addition of kinetic and potential energy
   c) power
   d) rate of change of energy

2) Which of the following physical quantity is conserved if total external torque acting on system of particles is zero?
   a) Linear momentum b) Angular momentum
   c) Kinetic energy d) Potential energy

3) Atwood's machine is example of _____ constraint.
   a) holonomic and scaleronomous
   b) non-holonomic
   c) non-holonomic and rheonomous
   d) rhenomous

4) According to Hamiloton's principle, the action integral for monogenic, conservative system should produce _____ value.
   a) unit b) zero
   c) maximum d) extremum

5) In Euler-Lagrange's equation the term, $\left(\frac{\partial L}{\partial q}\right)$ dimensionally represents.
   a) generalized force b) generalized momentum
   c) energy d) nothing

6) In central force problem, conservation of both _____ and _____ takes place.
   a) energy, angular momentum b) energy, torque
   c) angular momentum, torque d) linear momentum, force

7) In central force motion, the differential equation for orbit gives absurd result for $l =$ _____.
   a) 0 b) 1
   c) 2 d) 3

8) Newton's laws of motion to be valid in non-inertial frame, one requires _____.
   a) psudo force b) real force
   c) central force d) conservative force

B) State whether the following statement is True or False: **06**

1) Lagrange's approach cannot be treated as an alternative to Newtonian approach.
2) In case of conservative force, work done between two points is dependent on the path taken between those two points.
3) For "actual path" action integral gives extremum value that is maximum value.
4) Generalized co-ordinates need not be necessarily orthogonal curvilinear co-ordinates.
5) Form of the Hamilton's equations of motion remains invariant under canonical transformation.
6) In canonical transformation, new set of co-ordinates are cyclic.

Q.2 Write a short note on:

a) Conservation laws in central force motion **05**
b) Principle of least action **05**
c) Any two conservation laws for system of particles **04**

Q.3 Attempt the following questions:

a) Starting with D 'Almbert's principle, derive Euler-Lagrange's equation. **08**
b) Set up an equation of motion for Atwood's machine using Euler-Lagrange's equation. **06**

Q.4 Attempt the following questions:

a) Starting from Hamilton's principle, obtain Euler-Lagrange equation. **08**
b) Set up Hamiltonian for simple pendulum and derive equation of motion for it using the same Hamiltonian. **06**

Q.5 Attempt the following questions:

a) Discuss in detail four standard forms of canonical transformations. **08**
b) Show that the transformation $P = \frac{p^2+q^2}{2}, Q = tan^{-1}\left(\frac{q}{p}\right)$ is canonical. **06**

Q.6 Write a short note on:

a) In case of central force motion set up differential equation for orbit and hence deduce law of conservation of angular momentum for it **08**
b) In central force motion, discuss the motion under different cases of force constant (k) in inverse square law. **06**

Q.7 Write a short note on:

a) Derive Hamilton's canonical equation of motion in terms of Poisson bracket. **08**
b) Define Poisson bracket and give its any four important properties. **06**

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Seat No.	

Set P

M.Sc. (Semester - II) (CBCS) Examination Mar/Apr-2018
Physics (Applied Electronics)
QUANTUM MECHANICS

Time: 2½ Hours Max. Marks: 70

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

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

1) Heisenberg's uncertainty principle states _____
   a) A particles position can be measured exactly
   b) A particle's energy can be measured exactly
   c) The more precise a particle's momentum can be measured, the less precise its position can be measured
   d) The more precise a particle's momentum can be measured, the less precise its energy can be measured

2) The wave function for a particle must be normalizable because.
   a) The particle's charge must be conserved
   b) The particle's momentum must be conserved
   c) The particle must be somewhere
   d) The particle's angular momentum must be conserved

3) A particle has a total energy that is less than that of a potential barrier. When the particle penetrates the barrier, its wave function is _____.
   a) Exponentially decreasing b) Exponentially increasing
   c) A positive constant d) Oscillatory

4) According to Schrödinger, a particle is equivalent to a _____.
   a) Single wave b) Wave packet
   c) Light wave d) Cannot behave as wave

5) The energies of a particle in a box are given by _____.
   a) Continuous energy spectrum b) $\frac{n^2 \pi^2 \hbar^2}{2mL^2}$
   c) $\frac{\pi^2 \hbar^2}{2mL^2 n^2}$ d) $\frac{n\hbar}{2\pi}$

6) The wave function in the ground state of hydrogen atom is given as $\Psi = A \exp\ (^{-r}/_{a})$, where r measures distance from nucleus and a is constant. The value of A is _____
   a) $\frac{1}{\sqrt{\pi a}}$ b) $\frac{1}{\sqrt{\pi a^3}}$
   c) $\frac{1}{\sqrt{\pi.a}}$ d) $\frac{1}{\sqrt{\pi a^5}}$

B) State True or False **08**

1) Bound states Ψ must vanish at infinity.
2) The time development of a wave function is $i\hbar \frac{\partial \Psi}{\partial t} = \hat{H}\Psi$.
3) The eigenfunctions belonging to different eigenvalues of a unitary operator are mutually orthogonal.
4) In a non-linear molecule where electronic degeneracy occurs there always exists a vibrational mode which can remove the degeneracy
5) The combined space and spin function of an electron is called a spin-orbital.
6) The wave functions for different states of a harmonic oscillator are mutually orthonormal.
7) For many electron atoms, the electron repulsion terms must be excluded in the potential energy term of the wave equation.
8) The Born-Oppenheimer approximation is not valid as long as the various energy levels in a molecule are widely separated from each other.

Q.2 Write a short note on:

a) Shape of atomic orbitals **05**

b) Characteristics of the wave functions **04**

c) Show that the operators L_Z commustes with L^2. **05**

Q.3 a) Consider a symmetric "1-D rigid box" of length = 2a, **08**

$$V(x) = \begin{cases} = 0 & |x| \leq a \\ \to \infty \; x < -a; \; x > +a \end{cases}$$

Obtain the energy eigenvalues and eigenfunctions.

b) Normalize the energy eigen functions for a particle in a symmetric 1-D finite box (only odd parity) **06**

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

$$\Psi(\theta, \emptyset) = \text{Ⓗ}_{\ell,\pm m}(\theta)\, \emptyset_{\pm m}(\emptyset) = \gamma_{\ell,\pm m}(\theta, \emptyset)$$ **08**

b) Calculate the spherical harmonics: (a) $\gamma_{0,0}(\theta, \emptyset)$; (b) $\gamma_{1,\pm 1}(\theta, \emptyset)$ **06**

Q.5 a) Show that how the Hartree and Hartree – Fock self-consistent field methods are powerful for obtaining the ground state energy and wave functions of many-electron atoms. **10**

b) Write down the 1s orbital of the hydrogen atom and obtain the probability density $|\Psi_{1s}|^2$ **04**

Q.6 a) What is the Born-Oppenheimer approximation? Write and interpret each term of the wave equation for it. **08**

b) How the linear combination of atomic orbitals (LCAO) is the basis for the calculation of approximate energies and molecular orbitals in molecules? Explain. **06**

Q.7 a) Explain the fourth postulate of quantum mechanics. **08**

b) Prove that, if two operators $\hat{A}$ and $\hat{B}$ commute then they have the same set of eigenfunctions. **06**

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Seat No.	

Set P

M.Sc. (Semester - II) (CBCS) Examination Mar/Apr-2018
Physics (Applied Electronics)
ELECTRODYNAMICS

Time: 2½ Hours Max. Marks: 70

Instructions: 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) Select correct alternatives: **06**

1) Electric field intensity $(\vec{E})$ at any point in an electric field is equal to _____.
   a) Potential gradient
   b) (Potential gradient)^2
   c) (potential gradient)^{y2}
   d) None of the above

2) The unit of electric flux density is _____
   a) Coulomb
   b) Farad / meter
   c) Coulomb / (meter)^2
   d) Weber / (meter)^2

3) In electromagnetic wave, the phase difference between electric and magnetic field vectors $\vec{E}$ and $\vec{B}$ is _____.
   a) 0
   b) $\frac{\pi}{2}$
   c) π
   d) $\frac{\pi}{4}$

4) Magnetic vector potential due to magnetic dipole is proportional to ___.
   a) r
   b) $\frac{1}{r}$
   c) $\frac{1}{r^2}$
   d) $\frac{1}{r^3}$

5) Larmor formula for the power radiated by a non-relativistically accelerated charged particle is given by _____.
   a) $\frac{1}{4\pi\varepsilon_0}\left(\frac{2}{3}\right)\frac{e^2a^2}{c^3}$
   b) $\left(\frac{2}{3}\right)\frac{e^2a^2}{c^3}$
   c) $\frac{1}{4\pi\varepsilon_0}\left(\frac{2}{3}\right)\frac{e^2a}{c^2}$
   d) $\frac{1}{4\pi\varepsilon_0}\left(\frac{2}{3}\right)\frac{e^2a^2}{c^2}$

6) 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) 0
   d) 2π

B) State True or False **08**

1) A monochromatic electromagnetic waves that the field strength at a point varies with time according to sine or cosine function.
2) A free electron (placed in the path of a plane electromagnetic wave) will start moving along the magnetic field.
3) For good conductors, skin depth varies inversely with half power of frequency.
4) A plane-polarized monochromatic electromagnetic wave incident on a plane interface at the Brewster angle gives rise to a unpolarized reflected wave.

5) The direction of propagation of electromagnetic wave is $\vec{E}.\vec{B}$.
6) For the case of a particle moving under attractive central force field, the angular momentum is no more constant but changes due to radiation reaction.
7) The equation of continuity is $\nabla.\bar{J} - \frac{\partial \rho}{\partial t} = 0$
8) In isotropic non-conducting media, the speed of electromagnetic wave is less than that of free space.

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

a) State the boundary conditions for an electrostatic field $\bar{E}$. **05**

b) How the Maxwell corrected Ampere's law? What is the physical significance of displacement current? **05**

c) A long wire carries a current of uniform density. If i be the total current carried by the wire show that the magnetic energy per unit length stored within the wire is $\frac{\mu_0 i^2}{32\pi}$. **04**

Q.3 **a)** Obtain the expression for magnetic vector potential $\vec{A}(\vec{r})$ in terms of a volume current $\vec{J_b} = \vec{\nabla} \times \vec{M}$ and a surface current $\vec{K_b} = \vec{M} \times \hat{n}$. **10**

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

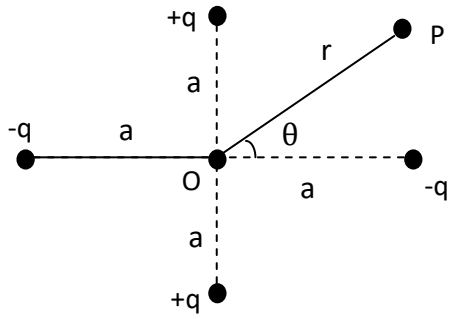
Q.4 **a)** Discuss the "Reflection and Transmission at oblique Incidence" and obtain the Fresnel's equations for the case of polarization in the plane of incidence. **10**

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

Q.5 **a)** What is Thomson scattering? Show that this scattering is independent of the frequency and wavelength of incident beam. **10**

b) If the incident radiation is plane polarized then find the total scattering cross section (L_T). What is the dimension of L_T? **04**

Q.6 **a)** Four charges are arranged as shown in the adjacent Figure. Calculate the monopole moment, dipole moment and quadrupole moment of the system. Hence calculate the electric field $\vec{E}$ at point 'P' located at a distance 'r' from the center of configuration. **10**



b) If at a point on boundary between two dielectric, the electric field make angles θ_1 and θ_2 with the normal in media of permittivity ϵ_1 and ϵ_2 respectively then show that $\frac{\tan\theta_1}{\tan\theta_2} = \frac{\epsilon_1}{\epsilon_2}$. **04**

Q.7 **a)** What are the Gauge transformations? Explain the (a) Coulomb Gauge and (b) Lorentz Gauge. **10**

b) What are the Faraday's law of electromagnetic induction and Lenz's law? **04**

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Seat No.		Set	P

M.Sc. (Semester - II) (CBCS) Examination Mar/Apr-2018
Physics (Applied Electronics)
MICROPROCESSORS & MICROCONTROLLERS

Time: 2½ Hours Max. Marks: 70

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

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

1) Which of the following SFR is not bit addressable?
   a) PO b) PSW
   c) PCON d) TCON

2) THE SFRs are maintained in the memory location.
   a) 80H onwards b) 30H onwards
   c) 00H onwards d) 07H onwards

3) An alternate function of P3.4 in 8051 is
   a) Timer 0 b) Timer 1
   c) Interrupt 0 d) Interrupt 1

4) Which of the following command copy the content of RAM whose address is in R0 to P1
   a) MOV @P1, R0 b) MOV @R0, P1
   c) MOV P1, @ R0 d) MOV P1, R0

5) The directive DQ means
   a) Define quantum b) Define Quad byte
   c) Define Quad word d) None of these

6) The BIU prefetches the instruction from memory and store them in _____.
   a) queue b) register
   c) memory d) stack

7) The _____ translates a byte from one code to another code.
   a) XCHG b) POP
   c) PUSH d) XLAT

8) In max mode, control bus signal S_0, S_1 and S_2 are sent out in _____ from.
   a) decoded b) encoded
   c) shared d) unshared

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

1) Serial Communication interrupt has lowest priority.
2) In 8086 total address lines are 16.
3) The STD (Set Direction Flag) decrements the string pointer.
4) 8086 microprocessor is of CISC architecture.
5) After reset the value in the stack pointer of 8051 is 00H.
6) The length of the instruction queue in 8086 is of 8 bytes.

Q.2	**a)**	Draw and explain the PSW format of 8086.	**05**
	b)	Explain the maximum mode of 8086.	**05**
	c)	Explain the hardware interrupts of 8051.	**04**
Q.3	**a)**	Explain the concept of memory segmentation in 8086. What are its advantages?	**08**
	b)	Write a assembly language program to block transfer in 8086 by using string instructions.	**06**
Q.4	**a)**	Draw and explain the architecture of 8086.	**08**
	b)	Explain the following instructions of 8086. i. NEG AL ii. REPNZ	**06**
Q.5	**a)**	Explain the memory organization of 8051.	**08**
	b)	Explain the following pins of 8051. i. $\overline{\text{EA}}$ ii. $\overline{\text{PSEN}}$	**06**
Q.6	**a)**	Explain the SFRs associated with Timers / Counters.	**08**
	b)	Write a assembly language program to find a square of the unpacked BCD number by using lookup table.	**06**
Q.7	**a)**	Explain the different modes of serial communication exit in 8051.	**08**
	b)	Explain the Port – 1 structure of 8051.	**06**

SLR-UR-566

Seat No.		Set	P

M.Sc. (Semester - II) (CBCS) Examination Mar/Apr-2018
Physics (Applied Electronics)
STATISTICAL MECHANICS

Time: 2½ Hours Max. Marks: 70

Instructions: 1) Q. (1) and (2) are compulsory.
2) Answer any three questions from Q.3 to Q.7.
3) Figures to the right indicate full marks.
4) All questions carry equal marks.

Q.1 A) Select the most correct alternative **06**

1) A phase space is a _____ dimensional space.
   a) 2 b) 5
   c) 3 d) 6

2) Which of the following is a Boson?
   a) Electron b) Positron
   c) Proton d) Photon

3) On the P-T diagram of phase transition, the state in which three phases coexist is represented by a point, known as _____.
   a) Critical point b) Sublimation point
   c) Boiling point d) Triple point

4) If N is the number of particles then the standard relative deviation from mean value in case of energy fluctuation is order of _____.
   a) $\sqrt{N}$ b) $\frac{\sqrt{N}}{2}$
   c) $\frac{1}{\sqrt{N}}$ d) $\frac{2}{\sqrt{N}}$

5) In which of the following ensemble, the temperature, chemical potential and volume is same but energy and number of particles are variable?
   a) Canonical ensemble b) Microcanonical ensemble
   c) Grand canonical ensemble d) None of the above

6) Which of the following is true for FD statistics
   a) $\frac{g_i}{\exp\,(\alpha+\beta E_i)+1}$ b) $\frac{g_i}{\exp\,(\alpha-\beta E_i)-1}$
   c) $\frac{g_i}{\exp(\alpha+\beta E_i)-1}$ d) $\frac{g_i}{\exp(\alpha-\beta E_i)+1}$

B) State true or false / Fill in the blank **08**

1) For microcanonical ensemble, volume and energy of a system is variable (True/False)
2) Fermi energy level is the highest occupied energy level by fermions at absolute zero. (True/False)
3) He^4 is a spin half particle. (True/False)
4) Specific heat (C_v) at constant volume of an ideal Bose gas is discontinuous at $T = T_0$ (where T_0 is degeneracy temperature). (True/False)
5) In canonical ensemble, the relative r. m. s. energy fluctuations of system is negligible if Number of particles in the system (N) is very large (True/False)

6) λ transition in liquid helium is an example of phase transition of second kind (True/False)
7) Photons obey Pauli's exclusion principle. (True/False)
8) The pressure of Fermi gas at absolute zero temperature is proportional to 5/3 power of the density. (True/False)

Q.2 Write a short note on following:

a) Maxwell – Boltzmann statistics **05**
b) Classical ideal gas **04**
c) Phase transition **05**

Q.3 **a)** Define and explain the types of ensembles. State their importance in statistical mechanics. **10**
b) Differentiate between Fermi-Dirac statistics and Bose-Einstein statistics. **04**

Q.4 **a)** Explain the second order phase transition with examples. **08**
b) Derive the Fokker-Plank equation. **06**

Q.5 **a)** What is an ideal Bose gas? Explain the Chemical Potential and Energy of an ideal BE gas. **08**
b) Explain the law of corresponding states. **06**

Q.6 **a)** What is mean by thermodynamic fluctuation? Explain fluctuation in enthalpy and volume. **10**
b) Derive an expression for distribution of particles having half-integral spin. **04**

Q.7 **a)** State the conditions for phase equilibrium and properties of matter near critical point. **10**
b) State and explain third law of thermodynamics. **04**

SLR-UR-567

Seat No.	

Set P

M.Sc. (Semester - III) (New) (CBCS) Examination Mar/Apr-2018
Physics (Applied Electronics)
SEMICONDUCTOR DEVICES

Time: 2½ Hours Max. Marks: 70

Instructions: 1) Q.1 and Q.2 are compulsory.
2) Attempt any three questions from Q. 2 to 7.
3) All questions carry equal marks.
4) Use of scientific calculator is allowed.

Q.1 Choose the correct alternative: **14**

1) The over drive factor for a BJT is given as _____.
   a) I_c / Ic_{sat} b) $I_b / I_{b\,sat}$
   c) $I_{c\,sat} / I_c$ d) $I_{b\,sat} / I_b$

2) In the linear region, power MOSFETs have I/P impedance in terms of _____.
   a) Ω b) $k\Omega$
   c) $m\Omega$ d) $\mu\Omega$

3) In the NDR devices, stability is achieved when _____.
   a) Semiconductor initially homogeneous becomes electrically heterogeneous
   b) Semiconductor initially homogeneous becomes electrically homogeneous
   c) Semiconductor initially heterogeneous becomes electrically homogeneous
   d) Semiconductor initially heterogeneous becomes electrically heterogeneous

4) If the bottom of the conduction band is located at _____ it is called τ-point.
   a) $k = \pi$ b) $k = 0$
   c) $k = -\pi$ d) $k = 2\pi$

5) In a SiO_2-Si MOS diode, the layer SiO_x is stoichiometric when _____.
   a) x = 0 b) x = 1
   c) x = 2 d) x = 3

6) The MIS interface charges are accurately & reliably measured by _____.
   a) Capacitive method b) Inductive method
   c) Both a & b d) Conductance method

7) For SiO_2- Si system, storage time τs is of the order of _____.
   a) 10^{-3} to 10^{-2} s b) 10^{-5} to 10^{-3} s
   c) 10^{-3} to 10^{-2} ms d) 10^{-5} to 10^{-3} ms

8) The dominating operating process for Laser diode is _____.
   a) Stimulated emission b) Absorption
   c) Spontaneous emission d) Reflection

9) For normal vision at the peak response _____ of the eye, 1W of radiant energy is equivalent.
   a) 600 b) 683
   c) 650 d) 693

10) The NDR is due to a field induced transfer of conduction band electrons form _____ to _____ satellite valley.
   a) Low energy – high mobility valley to high energy low mobility valley
   b) Low energy – low mobility valley to high energy low mobility valley
   c) High energy – low mobility valley to low energy high mobility valley
   d) Low energy – low mobility valley to high energy high mobility valley

11) In the MOS diodes strong inversion occurs at _____.
   a) $V < V_T$ b) $V = V_T$
   c) $V_T = 0$ d) $V = 0$

12) The figure of merit of a tunnel diode is given by,
   a) I_p b) I_o
   c) I_p / I_v d) I_v / I_p

13) The light modulation band width (Δf) is the frequency at which the light output is _____.
   a) Reduced to $1/\sqrt{2}$ b) Increased to $1/\sqrt{2}$
   c) Reduced to ½ d) Reduced to $2/\sqrt{2}$

14) A simple p-n junction diode in which both p & n sides are degenerate is ___.
   a) Tunnel diode b) Schottky diode
   c) Gunn diode d) Zener diode

Q.2 Attempt the following. (Any three) **14**
a) Explain static induction transistor.
b) Measurement of interface trapped charges.
c) Photoconductor.
d) What is flat-band shift?

Q.3 **a)** Explain how transfer efficiency can be improved with a buried channel CCD. **10**
b) Write a note on frequency response of a CCD. **04**

Q.4 **a)** Discuss with an energy band diagram and equivalent circuit, the p-n junction solar cell referred to open circuit voltage (V_{oc}), short circuit current (I_{sc}), maximum power output (P_m) & conversion efficiency (η). **10**
b) Calculate the modulation band width of a GaAs LED with a carrier life time of 100ps. **04**

Q.5 **a)** Discuss in detail the MOS-Controlled Thyristor. **10**
b) Mention its merits and demerits. **04**

Q.6 **a)** Explain 4 quadrant operation of a Triac. **10**
b) State which mode of operation is most sensitive and why? **04**

Q.7 **a)** Give a brief account of CMOS device. **07**
b) Discuss the volt-ampere characteristics of a tunnel diode. **07**

SLR-UR-568

Seat No.	

Set P

M.Sc. (Semester - III) (New) (CBCS) Examination Mar/Apr-2018
Physics (Applied Electronics)
ATOMIC, MOLECULAR & NUCLEAR PHYSICS

Time: 2½ Hours Max. Marks: 70

Instructions: 1) Q.1 and Q.2 are compulsory.
2) All questions carry equal marks.
3) Figures to the right indicate full marks.
4) Use of non programmable calculator is allowed.

Q.1 Objectives questions:-

A) Select the correct alternatives: **06**

1) In the nuclear shell model the spin parity of ^{15}N is given by
   a) $\frac{1^{--}}{2}$ b) $\frac{3^{--}}{2}$
   c) $\frac{1^{+}}{2}$ d) $\frac{3^{+}}{2}$

2) A nucleus with mass number 204 decay by α-emission. The Q-value of the reaction is 5.26MeV. The kinetic energy of the α-particle is
   a) 5.26MeV b) $5.26 \times \frac{200}{204}\ MeV$
   c) 2.63MeV d) $5.26 \times \frac{4}{204}\ MeV$

3) The magic number in nuclear physics arises mainly due to
   a) Dipole-dipole interactions b) Short character of nuclear force
   c) Spin orbit interaction d) Coulomb interaction

4) Pauli's Exclusion principle state that two electrons in same orbital's have
   a) Same spins b) Different spins
   c) Opposite spins d) Vertical spins

5) The Lande g factor for single state is _____.
   a) 0 b) 2
   c) 1 d) 3

6) _____ type of molecules have all moment of inertia $I_A \neq I_B \neq I_C$
   a) Linear molecules b) Symmetric tops
   c) Spherical top d) Asymmetric tops

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

1) Asymmetric tops types of molecules have all moment of inertia _____.
2) The electric quadrupole moment is negative; shape of the nuclei is _____.
3) The fine structure splitting of 3s, 3p, 2s and 2p level of hydrogen atom, the number of allowed transition between them _____.
4) The Scattering amplitude of n-p interaction is _____.

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

1) Atomic energy levels are characterized by a quantum number n = 1, 2, 3, 4, _____ called the principal quantum number (True/False)
2) HCl and CO shows rotational spectra. (True/False)
3) If Q value of nuclear reaction is positive the reaction is endothermic. (True/False)
4) The selection rule for a rotational transition is, $\Delta J = \pm 1$ (True/False)

Q.2 A) Write short notes:-

1) Explain electric quadrapole moment for an ellipsoidal charge distribution. **05**
2) Write short note on superconductivity model? **05**
3) State impotents of Lande of factor? Calculate it for $^2D_{5/2}$ term. **04**

Q.3 A) Explain various predications of the liquid drop model. Give a brief description of semiempirical mass formula. **08**

B) Write down the predictions of the Shell Model. Give the achievements and failures of shell model? **06**

Q.4 A) Derive an expression for differential cross-section in laboratory system for p-p scattering at low energies. **08**

B) What are similarities between n-n and p-p forces? **06**

Q.5 A) Describe the compound nucleus theory of nuclear reactions. Give the experimental evidences in support of this theory **08**

B) What are nuclear reactions? Discuss various conservation laws in nuclear reactions with illustrative examples. **06**

Q.6 A) Obtain the expression of Lande splitting factor (g) for LS and JJ coupling. **08**

B) Distinguish between the energy levels of a rigid and a non rigid rotor. **06**

Q.7 A) Explain diatomic molecule as a rigid rotator. **08**

B) Obtain the expression of for diatomic molecule as a rigid rotator. **06**

SLR-UR-569

Seat No.		Set	P

M.Sc. (Semester - III) (New) (CBCS) Examination Mar/Apr-2018
Physics (Applied Electronics)
COMMUNICATION SYSTEM

Time: 2½ Hours Max. Marks: 70

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

Q.1 A) Select the correct alternative: **06**

1) The process of impressing information on carrier signal is called
   a) mixing b) impressing
   c) modulation d) detection

2) The modulation index of an AM wave is changed from 0 to 1. The transmitter power is
   a) unchanged b) halved
   c) doubled d) increased by 50%

3) The demodulator circuit of the frequency modulated signal is called
   a) decoder b) AFC
   c) discriminator d) envelop detector

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

5) Two binary values are represented by two different frequencies in
   a) ASK b) FSK
   c) PSK d) None of the above

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

Q.1 B) Fill in the blanks: **04**

1) ASK, PSK and FSK are the examples of _____ to _____ encoding.
2) _____ is the category of data transmission, if the binary pulse is maintained for the entire bit time.
3) A PAM signal is demodulated with _____ filter.
4) VCO is a part _____.

Q.1 C) State true and false: **04**

1) TDM system is more immune to inter-channel cross talk as compared to FDM system.
2) PPM can be generated from PWM signals.
3) Pulse modulation is often used in telegraphy.
4) In full duplex communication system, the flow of information takes place in both directions simultaneously.

Q.2	**Answer the following:**		**14**
	A)	Write a brief note on Class B modulated power amplifiers.	
	B)	Discuss low and high level modulation.	
	C)	Write a brief note on data formats.	
Q.3	**A)**	Discuss the construction and operation of AM receiver and detector circuits.	**10**
	B)	Write the advantages of FM over AM.	**04**
Q.4	**A)**	With relevant diagram, discuss in detail, the construction and working of pulse position modulator and demodulators circuits.	**10**
	B)	Explain the Sampling theorem.	**04**
Q.5	**A)**	With relevant diagram, discuss in detail, the process of PSK and DPSK.	**10**
	B)	Explain the cross talk in TDM.	**04**
Q.6	**A)**	Describe the generation and demodulation PTM signals.	**10**
	B)	What is a transponder? Explain.	**04**
Q.7	**A)**	With relevant diagram and waveforms, explain the functioning of PDMA systems.	**10**
	B)	Write a brief note on multiplexing.	**04**

SLR-UR-571

Seat No.	

Set P

M.Sc. (Semester - III) (Old) (CBCS) Examination Mar/Apr-2018
Physics (Applied Electronics)
SEMICONDUCTOR DEVICES

Time: 2½ Hours Max. Marks: 70

Instructions: 1) Q.1 and Q.2 are compulsory.
2) Attempt any three questions from Q. 2 to 7.
3) All questions carry equal marks.
4) Use of scientific calculator is allowed.

Q.1 Choose the correct alternative: **14**

1) The over drive factor for a BJT is given as _____.
   a) I_c / Ic_{sat} b) $I_b / I_{b\,sat}$
   c) $I_{c\,sat} / I_c$ d) $I_{b\,sat} / I_b$

2) In the linear region, power MOSFETs have I/P impedance in terms of _____.
   a) Ω b) $k\Omega$
   c) $m\Omega$ d) $\mu\Omega$

3) In the NDR devices, stability is achieved when _____.
   a) Semiconductor initially homogeneous becomes electrically heterogeneous
   b) Semiconductor initially homogeneous becomes electrically homogeneous
   c) Semiconductor initially heterogeneous becomes electrically homogeneous
   d) Semiconductor initially heterogeneous becomes electrically heterogeneous

4) If the bottom of the conduction band is located at _____ it is called τ-point.
   a) $k = \pi$ b) $k = 0$
   c) $k = -\pi$ d) $k = 2\pi$

5) In a SiO_2-Si MOS diode, the layer SiO_x is stoichiometric when _____.
   a) x = 0 b) x = 1
   c) x = 2 d) x = 3

6) The MIS interface charges are accurately & reliably measured by _____.
   a) Capacitive method b) Inductive method
   c) Both a & b d) Conductance method

7) For SiO_2- Si system, storage time τs is of the order of _____.
   a) 10^{-3} to 10^{-2} s b) 10^{-5} to 10^{-3} s
   c) 10^{-3} to 10^{-2} ms d) 10^{-5} to 10^{-3} ms

8) The dominating operating process for Laser diode is _____.
   a) Stimulated emission b) Absorption
   c) Spontaneous emission d) Reflection

9) For normal vision at the peak response _____ of the eye, 1W of radiant energy is equivalent.
   a) 600 b) 683
   c) 650 d) 693

10) The NDR is due to a field induced transfer of conduction band electrons form _____ to _____ satellite valley.
   a) Low energy – high mobility valley to high energy low mobility valley
   b) Low energy – low mobility valley to high energy low mobility valley
   c) High energy – low mobility valley to low energy high mobility valley
   d) Low energy – low mobility valley to high energy high mobility valley

11) In the MOS diodes strong inversion occurs at _____.
   a) $V < V_T$ b) $V = V_T$
   c) $V_T = 0$ d) $V = 0$

12) The figure of merit of a tunnel diode is given by,
   a) I_p b) I_o
   c) I_p / I_v d) I_v / I_p

13) The light modulation band width (Δf) is the frequency at which the light output is _____.
   a) Reduced to $1/\sqrt{2}$ b) Increased to $1/\sqrt{2}$
   c) Reduced to ½ d) Reduced to $2/\sqrt{2}$

14) A simple p-n junction diode in which both p & n sides are degenerate is ___.
   a) Tunnel diode b) Schottky diode
   c) Gunn diode d) Zener diode

Q.2 Attempt the following. (Any three) **14**
a) Explain static induction transistor.
b) Measurement of interface trapped charges.
c) Photoconductor.
d) What is flat-band shift?

Q.3 **a)** Explain how transfer efficiency can be improved with a buried channel CCD. **10**
b) Write a note on frequency response of a CCD. **04**

Q.4 **a)** Discuss with an energy band diagram and equivalent circuit, the p-n junction solar cell referred to open circuit voltage (V_{oc}), short circuit current (I_{sc}), maximum power output (P_m) & conversion efficiency (η). **10**
b) Calculate the modulation band width of a GaAs LED with a carrier life time of 100ps. **04**

Q.5 **a)** Discuss in detail the MOS-Controlled Thyristor. **10**
b) Mention its merits and demerits. **04**

Q.6 **a)** Explain 4 quadrant operation of a Triac. **10**
b) State which mode of operation is most sensitive and why? **04**

Q.7 **a)** Give a brief account of CMOS device. **07**
b) Discuss the volt-ampere characteristics of a tunnel diode. **07**

SLR-UR-572

Seat No.	

Set P

M.Sc. (Semester - III) (Old) (CBCS) Examination Mar/Apr-2018
Physics (Applied Electronics)
ATOMIC, MOLECULAR & NUCLEAR PHYSICS

Time: 2½ Hours Max. Marks: 70

Instructions: 1) Q.1 and Q.2 are compulsory.
2) All questions carry equal marks.
3) Figures to the right indicate full marks.
4) Use of non programmable calculator is allowed.

Q.1 Objectives questions:-

A) Select the correct alternatives: **06**

1) In the nuclear shell model the spin parity of ^{15}N is given by
   a) $\frac{1^{--}}{2}$ b) $\frac{3^{--}}{2}$
   c) $\frac{1^{+}}{2}$ d) $\frac{3^{+}}{2}$

2) A nucleus with mass number 204 decay by α-emission. The Q-value of the reaction is 5.26MeV. The kinetic energy of the α-particle is
   a) 5.26MeV b) $5.26 \times \frac{200}{204}\ MeV$
   c) 2.63MeV d) $5.26 \times \frac{4}{204}\ MeV$

3) The magic number in nuclear physics arises mainly due to
   a) Dipole-dipole interactions b) Short character of nuclear force
   c) Spin orbit interaction d) Coulomb interaction

4) Pauli's Exclusion principle state that two electrons in same orbital's have
   a) Same spins b) Different spins
   c) Opposite spins d) Vertical spins

5) The Lande g factor for single state is _____.
   a) 0 b) 2
   c) 1 d) 3

6) _____ type of molecules have all moment of inertia $I_A \neq I_B \neq I_C$
   a) Linear molecules b) Symmetric tops
   c) Spherical top d) Asymmetric tops

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

1) Asymmetric tops types of molecules have all moment of inertia _____.
2) The electric quadrupole moment is negative; shape of the nuclei is _____.
3) The fine structure splitting of 3s, 3p, 2s and 2p level of hydrogen atom, the number of allowed transition between them _____.
4) The Scattering amplitude of n-p interaction is _____.

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

1) Atomic energy levels are characterized by a quantum number n = 1, 2, 3, 4, _____ called the principal quantum number (True/False)
2) HCl and CO shows rotational spectra. (True/False)
3) If Q value of nuclear reaction is positive the reaction is endothermic. (True/False)
4) The selection rule for a rotational transition is, $\Delta J = \pm 1$ (True/False)

Q.2 A) Write short notes:-

1) Explain electric quadrapole moment for an ellipsoidal charge distribution. **05**
2) Write short note on superconductivity model? **05**
3) State impotents of Lande of factor? Calculate it for $^2D_{5/2}$ term. **04**

Q.3 A) Explain various predications of the liquid drop model. Give a brief description of semiempirical mass formula. **08**

B) Write down the predictions of the Shell Model. Give the achievements and failures of shell model? **06**

Q.4 A) Derive an expression for differential cross-section in laboratory system for p-p scattering at low energies. **08**

B) What are similarities between n-n and p-p forces? **06**

Q.5 A) Describe the compound nucleus theory of nuclear reactions. Give the experimental evidences in support of this theory **08**

B) What are nuclear reactions? Discuss various conservation laws in nuclear reactions with illustrative examples. **06**

Q.6 A) Obtain the expression of Lande splitting factor (g) for LS and JJ coupling. **08**

B) Distinguish between the energy levels of a rigid and a non rigid rotor. **06**

Q.7 A) Explain diatomic molecule as a rigid rotator. **08**

B) Obtain the expression of for diatomic molecule as a rigid rotator. **06**

SLR-UR-573

Seat No.	

Set P

M.Sc. (Semester - III) (Old) (CBCS) Examination Mar/Apr-2018
Physics (Applied Electronics)
COMMUNICATION SYSTEM

Time: 2½ Hours Max. Marks: 70

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

Q.1 A) Select the correct alternative: **06**

1) The process of impressing information on carrier signal is called
   a) mixing b) impressing
   c) modulation d) detection

2) The modulation index of an AM wave is changed from 0 to 1. The transmitter power is
   a) unchanged b) halved
   c) doubled d) increased by 50%

3) The demodulator circuit of the frequency modulated signal is called
   a) decoder b) AFC
   c) discriminator d) envelop detector

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

5) Two binary values are represented by two different frequencies in
   a) ASK b) FSK
   c) PSK d) None of the above

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

Q.1 B) Fill in the blanks: **04**

1) ASK, PSK and FSK are the examples of _____ to _____ encoding.
2) _____ is the category of data transmission, if the binary pulse is maintained for the entire bit time.
3) A PAM signal is demodulated with _____ filter.
4) VCO is a part _____.

Q.1 C) State true and false: **04**

1) TDM system is more immune to inter-channel cross talk as compared to FDM system.
2) PPM can be generated from PWM signals.
3) Pulse modulation is often used in telegraphy.
4) In full duplex communication system, the flow of information takes place in both directions simultaneously.

Q.2	**Answer the following:**		**14**
	A)	Write a brief note on Class B modulated power amplifiers.	
	B)	Discuss low and high level modulation.	
	C)	Write a brief note on data formats.	
Q.3	**A)**	Discuss the construction and operation of AM receiver and detector circuits.	**10**
	B)	Write the advantages of FM over AM.	**04**
Q.4	**A)**	With relevant diagram, discuss in detail, the construction and working of pulse position modulator and demodulators circuits.	**10**
	B)	Explain the Sampling theorem.	**04**
Q.5	**A)**	With relevant diagram, discuss in detail, the process of PSK and DPSK.	**10**
	B)	Explain the cross talk in TDM.	**04**
Q.6	**A)**	Describe the generation and demodulation PTM signals.	**10**
	B)	What is a transponder? Explain.	**04**
Q.7	**A)**	With relevant diagram and waveforms, explain the functioning of PDMA systems.	**10**
	B)	Write a brief note on multiplexing.	**04**

SLR-UR-574

Seat No.	

Set P

M.Sc. (Semester - III) (Old) (CBCS) Examination Mar/Apr-2018
Physics (Applied Electronics)
INSTRUMENTATION

Time: 2½ Hours. Max. Marks: 70

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

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

1) A strip chart recorder is _____
   a) An active transducer
   b) An inverse transducer
   c) An output transducer
   d) Both (b) & (c)

2) The gauge factor is defined as _____
   a) ΔL/L / ΔR/R
   b) ΔR/R / ΔL/L
   c) ΔR/R / ΔD/D
   d) ΔR/R / $\Delta\sigma/\sigma$

3) A transducer has an output impedance 1KΩ and load resistance 1MΩ, the transducer behaves as _____
   a) A constant current source
   b) A constant voltage source
   c) A constant power source
   d) None of the above

4) One of the following can act as inverse transducer _____
   a) Electrical resistance potentiometer
   b) LVDT
   c) Capacitive transducer
   d) Piezoelectric crystals

5) A buffer amplifier has gain of _____
   a) Infinity
   b) Zero
   c) Unity
   d) Dependent upon the circuit parameter

6) Offset voltage in OPAMPS are produced because of _____
   a) Variations in the input voltage applied to amplifier
   b) Mismatch between the input signals applied to the OPAMP
   c) Mismatch between the two differential amplifiers which form IC of the OPAMP
   d) None of the above

7) If an information is required to be stored over a short interval of time
   a) A single number/devices should be used
   b) A CRO with photographic equipment should be used
   c) A direct writing recorder or a magnetic tape recorder should be used
   d) A storage type oscilloscope should be used

8) Digital instrument have input impedance of the order of _____
   a) mΩ
   b) Ω
   c) kΩ
   d) MΩ

Q.1 B) State whether following statements true or false: **06**

1) Photo emissive cell is an active transducer.
2) Unbounded strain gauges are exclusively used for transducer applications.
3) Capacitive transducer are normally used for both static and dynamic measurement
4) Resolution of 8 bit ADC is 128
5) X-Y plates in CRO is part of electron gun
6) De sauty's bridge is suitable only for pure capacitor

Q.2 Attempt the following:

a) Explain basic principle of hall effect **05**
b) Explain isolation amplifier **05**
c) Explain sample and hold circuit **04**

Q.3 a) Explain different capacitance transducer in detail. **08**
b) Explain triangular wave generator in detail. **06**

Q.4 a) Explain strain gauge and derive equation for gauge factor. **08**
b) Explain peak detector circuit in detail. **06**

Q.5 a) Explain R2R ladder DAC in detail. **08**
b) Explain the concept of virtual instrumentation. **06**

Q.6 a) Explain the different digital voltmeter in detail. **08**
b) Explain the resistance measurement techniques in detail. **06**

Q.7 a) Explain in detail the dual trace CRO with time base generation. **08**
b) Explain universal counter in detail. **06**

SLR-UR-575

Seat No.		Set	P

M.Sc. (Semester - IV) (New) (CBCS) Examination Mar/Apr-2018
Physics (Applied Electronics)
MICROELECTRONICS

Time: 2½ Hours Max. Marks: 70

Instructions: 1) Q. (1) and (2) are compulsory.
2) Answer any three questions from Q.3 to Q.7.
3) All questions carry equal marks.
4) Use of nonprogrammable calculator is allowed.

Q.1 Select the most correct alternative. **14**

1) For microelectronic applications, growth of single crystal Si along _____ is favored.
   a) 110 b) 100
   c) 101 d) 111

2) The effective impurity concentration for a reliable diffusion of boron in Si is _____ atoms / cm^3.
   a) 10^{19} b) 10^{18}
   c) 10^{20} d) 10^{21}

3) Molecular Beam Epitaxy is a _____ process.
   a) CVD b) Non-CVD
   c) PVD d) VPE

4) In MOS-devices, the gate electrode used is usually _____.
   a) Polysilicon b) Single Crystal Silicon
   c) Multilayered Silicon d) Stoichiometric Nitrides

5) Poly-Si deposition using CVD follows _____ behavior.
   a) Arrhenius b) Ohmic
   c) Kirchooff's d) Exponential

6) Out of the following oxide charges, which are the orientation dependent?
   a) Fixed Oxide Charges b) Interface Trapped Charges
   c) Mobile Ionic Charges d) Oxide Trapped Charges

7) Al forms a _____ contact with Silicon.
   a) Non-Ohmic b) Ohmic
   c) Abrupt d) Rectifying

8) Glassivation is usually done by _____.
   a) CVD b) CBD
   c) ECD d) MBE

9) Which Photoresist is specially developed for LSI / VLSI circuit fabrication
   a) Iso-fine Kodak-820 b) Novolac
   c) Hunt-way HPR-256 d) Iso-fine-Kodak-280

10) In a constant source diffusion, surface concentration is always
   a) Decreasing b) Increasing
   c) Constant d) Both a) and b)

11) Fick's first law of diffusion is expressed as _____.
   a) $j = D\,\partial N/\partial x$ b) $j = -\partial^2 N/\partial x^2$
   c) $j = -D\,\partial N/\partial x$ d) $j = -\partial N/\partial x$

12) _____ is used as a selective mask for oxidation of Si.
   a) Si_3N_4 b) SiO_2
   c) Si_2N_3 d) SiN_3

13) Si_3N_4 forms a Zero stress material with _____.
   a) SiO_2 b) Si_2O_3
   c) Si_3O_4 d) SiN_3

14) Glue layer in metallization is the, reduction of SiO_2_____.
   a) W b) Al
   c) Mo d) Ti

Q.2 **Write a note on. (Any Three)** **14**
a) Etch back effect
b) Substitutional diffusion
c) Multilevel metallization
d) Oxide charges

Q.3 **a)** Give a brief account of Vapor Phase Epitaxy for the growth of single crystal silicon. **10**
b) What is a negative Photoresist? **04**

Q.4 **a)** State and Explain Fick's 1st law of diffusion. **10**
b) Explain in brief an interstitial diffusion. **04**

Q.5 **a)** Discuss in brief the Molecular Beam Epitaxy for the epitaxial growth of Si. **10**
b) Mention the salient feature of MBE over CVD. **04**

Q.6 What is Oxidation? Discuss Deal and Groves model for kinetics of Si-Oxidation. **14**

Q.7 **a)** Give an account of gas source system for diffusion of Boron in Silicon. **10**
b) Write a note on wire bonding. **04**

SLR-UR-576

Seat No.		Set	P

M.Sc. (Semester - IV) (New) (CBCS) Examination Mar/Apr-2018
Physics (Applied Electronics)
MICROWAVE DEVICES & CIRCUITS

Time: 2½ Hours Max. Marks: 70

Instructions: 1) Q. (1) and (2) are compulsory.
2) Answer any three questions from Q.3 to Q.7.
3) All questions carry equal marks.

Q.1 A) Select the most correct alternative. **06**

1) According to IEEE, the microwave frequency range of Ku-band is
   a) 4 to 8 GHz b) 8 to 12 GHz
   c) 12 to 18 GHz d) 18 to 26 GHz

2) The following waves do not exist in waveguides
   a) TM waves b) TEM waves
   c) TE waves d) TE and TM waves

3) The periodic fluctuations of current passing through the n-type GaAs was discovered by
   a) J. B. Gunn b) R. C. Johnson
   c) B. C. DeLoach d) B. G. Cohen

4) The two cavity Klystron is operated on the principle of
   a) velocity modulation b) velocity and current modulation
   c) current modulation d) none of the above

5) A microstripline is also called as
   a) open-strip line b) closed-strip line
   c) mismatch line d) none of the above

6) The characteristic impedance of a rectangular waveguide is
   a) 50 Ohms b) 75 Ohms
   c) 100 Ohms d) 300 Ohms

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) The Gunn diode is always operated in the negative resistance region.
4) A line terminated in its characteristic impedance has a standing wave ratio of unity.
5) The impedance matching is very desirable in transmission line.
6) The passive elements used to control the amount of microwave power in a transmission line are called as attenuators.
7) The EM wave inside a waveguide can have an infinite number of patterns called modes.
8) In wave polarization, the orientation of electric field changes.

Q.2	**Write short notes.**		**14**
	a)	Maxwell's Equations	**05**
	b)	Gunn effect	**05**
	c)	Waveguide attenuators	**04**
Q.3	**a)**	Derive the wave equations with the help of Maxwell's equations.	**10**
	b)	Give an account on boundary conditions.	**04**
Q.4	**a)**	Derive the equations transmission coefficient and reflection coefficient.	**08**
	b)	Derive an expression for velocity modulation in klystron.	**06**
Q.5	**a)**	Discuss in detail, the various coaxial and stripline components.	**10**
	b)	Give an account on impedance matching.	**04**
Q.6	**a)**	Derive equations for losses in coaxial lines.	**10**
	b)	Write note on standing wave ratio.	**04**
Q.7	**a)**	With a neat sketch, explain the construction and working of phase shifters.	**08**
	b)	Write a note on wave propagation in perfect insulators.	**06**

SLR-UR-577

Seat No.		Set	P

M.Sc. (Semester - IV) (New) (CBCS) Examination Mar/Apr-2018
Physics (Applied Electronics)
MICROPROCESSORS & INTERFACING

Time: 2½ Hours Max. Marks: 70

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

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

1) The 8259 is
   a) PPI device b) PIC device
   c) PIT device d) Keyboard and display interface

2) Which pins are used as handshaking signals during mode-1 operation of the 8255?
   a) PA0 – PA7 b) PB0–PB7
   c) PC0–PC5 d) PC6–PC7

3) The advantages of I/O mapped I/O over memory mapped I/O is,
   a) Faster
   b) Many instructions supporting I/O mapped I/O
   c) Require a bigger address decoder
   d) All the above

4) 8253, a programmable interval timer consists of
   a) Three, 8-bit counters b) Two, 16-bit counters
   c) Three, 16-bit counters d) Two, 8-bit counters

5) 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

6) The time taken by the ADC from the active edge of SOC (start of conversion) pulse till the active edge of EOC (end of conversion) signal is called
   a) Edge time b) Conversion over
   c) Conversion delay d) Time delay

7) 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 these

8) The RST7.5 is
   a) Level triggered interrupt b) Non – maskable interrupt
   c) Highest priority interrupt d) Edge triggered interrupt

B) State true or false **06**

1) Software interrupts are vectored interrupts.
2) To interface 32K of memory to 8085, fifteen address lines are required.
3) The display can be blanked by using BD line of 8279.
4) ADC0809 is a 16 bit.
5) In the 8255 Mode-2 the Port-B either can be used in Mode-0 or Mode-1.
6) In the general purpose mode of 8259 IR_7 as the highest priority.

Q.2	**a)**	Write a program to generate a square wave on PC1 pin be using BSR mode.	**05**
	b)	Explain the control word format of 8253.	**05**
	c)	Explain the features of 8255.	**04**
Q.3	**a)**	Interface 2K × 8 EPROM to 8085 by using 2K × 4 EPROM. Determine its initial and final address.	**08**
	b)	Draw the block diagram of 8255.	**06**
Q.4	**a)**	Interface 8259 to 8085 in I/O mapped I/O. Use 3:8 decoder for address decoding.	**08**
	b)	Explain the Mode-1 of 8255	**06**
Q.5	**a)**	Draw and explain the block diagram of 8253.	**08**
	b)	Explain the different modes of 8253.	**06**
Q.6	**a)**	Interface 8279 to 8085. Use 3:8 decoder for address decoding	**08**
	b)	Explain the features of 8279.	**06**
Q.7	**a)**	Explain the ICWs (Initialization Command Words) of 8259	**08**
	b)	Explain flash type of ADC.	**06**

SLR-UR-579

Seat No.	

Set P

M.Sc. (Semester - IV) (New) (CBCS) Examination Mar/Apr-2018
Physics (Applied Electronics)
FIBER OPTIC COMMUNICATIONS

Time: 2½ Hours Max. Marks: 70

Instructions: 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) Assume suitable data in necessary.

Q.1 A) Select the correct alternative: **06**

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

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

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

4) Microscopic meandering of the fiber core axis is known as
   a) Bending b) Microbending
   c) Dispersion d) None of these

5) Multipath dispersion does not exist in a
   a) Single mode fiber b) Multi mode fiber
   c) Plastic optical fiber

6) The internal quantum efficiency of LED decreases with
   a) Increase in temp b) Decrease in temp
   c) Increase in pressure d) Decrease in pressure

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

1) Multimode graded index fibers exhibit for less intermodal dispersion than multimode step index fibers due to their multipath reflection.
2) Linear scattering may also occur at in homogeneities which are comparable in size with the guided wavelengths.
3) The LED can operate at higher current density than the injection laser.
4) Numerical aperture of an optical fiber represents the cone outside which the light is incident on fiber end
5) The refractive index profile of the fiber cladding plays an important role in characterizing the properties of optical fibers.
6) Microscopic meandering of the fiber core axis is known as Dispersion.
7) In order to allow operation at longer wavelengths where the light penetrates more deeply into the semiconductor material, a wider depletion region is necessary.
8) Stimulated Brillouin scattering may be regarded as the modulation of light through thermal molecular vibrations within the fiber.

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

a) Linear and non scattering losses **05**

b) Attenuation measurement technique using the loss at a single wavelength **05**

c) Fiber connectors **04**

Q.3 a) Define quantum efficiency and responisivity of a photo detector. Derive expression for responsivity of an intrinsic photo detector in terms of efficiency and wavelength of incident radiation of device. **08**

b) A p-n photodiode has a quantum efficiency of 50% at the wavelength of 0.9 μm. Calculate: **06**

1) Its responsivity at 0.9μm
2) The received optical power if the mean photocurrent is 10^{-6} A.

Q.4 a) Define relative refractive index difference for an optical fiber & show how it may be related to Numerical aperture. **08**

b) Explain requirements of optical sources. **06**

Q.5 a) Explain a typical experimental arrangement for the measurement of dispersion loss with the swept frequency measurement method. **08**

b) An 8 km optical fiber link without repeaters uses multimode graded index fiber which has a bandwidth length product of 400MhzKm.Estimate: **06**

1) The total pulse broadening on the link
2) The rms pulse broadening on the link

Q.6 a) What are the different applications of fiber optics, explain in detail? **08**

b) The velocity of light in the core of a step index fiber is $2.01X10^{8}$ ms^{-1}, & critical angle at the core cladding interface is 80°. Determine the numerical aperture & acceptance angle for the fiber in air, assuming it has a core diameter suitable for consideration for ray analysis. **06**

Q.7 a) What are couplers? Explain different types of couplers used in fiber optical communication. **08**

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

SLR-UR-580

Seat No.		Set	P

M.Sc. (Semester - IV) (Old) (CBCS) Examination Mar/Apr-2018
Physics (Applied Electronics)
MICROELECTRONICS

Time: 2½ Hours Max. Marks: 70

Instructions: 1) Q. (1) and (2) are compulsory.
2) Answer any three questions from Q.3 to Q.7.
3) All questions carry equal marks.
4) Use of nonprogrammable calculator is allowed.

Q.1 Select the most correct alternative. **14**

1) For microelectronic applications, growth of single crystal Si along _____ is favored.
   a) 110 b) 100
   c) 101 d) 111

2) The effective impurity concentration for a reliable diffusion of boron in Si is _____ atoms / cm^3.
   a) 10^{19} b) 10^{18}
   c) 10^{20} d) 10^{21}

3) Molecular Beam Epitaxy is a _____ process.
   a) CVD b) Non-CVD
   c) PVD d) VPE

4) In MOS-devices, the gate electrode used is usually _____.
   a) Polysilicon b) Single Crystal Silicon
   c) Multilayered Silicon d) Stoichiometric Nitrides

5) Poly-Si deposition using CVD follows _____ behavior.
   a) Arrhenius b) Ohmic
   c) Kirchooff's d) Exponential

6) Out of the following oxide charges, which are the orientation dependent?
   a) Fixed Oxide Charges b) Interface Trapped Charges
   c) Mobile Ionic Charges d) Oxide Trapped Charges

7) Al forms a _____ contact with Silicon.
   a) Non-Ohmic b) Ohmic
   c) Abrupt d) Rectifying

8) Glassivation is usually done by _____.
   a) CVD b) CBD
   c) ECD d) MBE

9) Which Photoresist is specially developed for LSI / VLSI circuit fabrication
   a) Iso-fine Kodak-820 b) Novolac
   c) Hunt-way HPR-256 d) Iso-fine-Kodak-280

10) In a constant source diffusion, surface concentration is always
   a) Decreasing b) Increasing
   c) Constant d) Both a) and b)

11) Fick's first law of diffusion is expressed as _____.
   a) $j = D\,\partial N/\partial x$ b) $j = -\partial^2 N/\partial x^2$
   c) $j = -D\,\partial N/\partial x$ d) $j = -\partial N/\partial x$

12) _____ is used as a selective mask for oxidation of Si.
   a) Si_3N_4 b) SiO_2
   c) Si_2N_3 d) SiN_3

13) Si_3N_4 forms a Zero stress material with _____.
   a) SiO_2 b) Si_2O_3
   c) Si_3O_4 d) SiN_3

14) Glue layer in metallization is the, reduction of SiO_2_____.
   a) W b) Al
   c) Mo d) Ti

Q.2 **Write a note on. (Any Three)** **14**
a) Etch back effect
b) Substitutional diffusion
c) Multilevel metallization
d) Oxide charges

Q.3 **a)** Give a brief account of Vapor Phase Epitaxy for the growth of single crystal silicon. **10**
b) What is a negative Photoresist? **04**

Q.4 **a)** State and Explain Fick's 1st law of diffusion. **10**
b) Explain in brief an interstitial diffusion. **04**

Q.5 **a)** Discuss in brief the Molecular Beam Epitaxy for the epitaxial growth of Si. **10**
b) Mention the salient feature of MBE over CVD. **04**

Q.6 What is Oxidation? Discuss Deal and Groves model for kinetics of Si-Oxidation. **14**

Q.7 **a)** Give an account of gas source system for diffusion of Boron in Silicon. **10**
b) Write a note on wire bonding. **04**

SLR-UR-581

Seat No.		Set	P

M.Sc. (Semester - IV) (Old) (CBCS) Examination Mar/Apr-2018
Physics (Applied Electronics)
MICROWAVE DEVICES & CIRCUITS

Time: 2½ Hours Max. Marks: 70

Instructions: 1) Q. (1) and (2) are compulsory.
2) Answer any three questions from Q.3 to Q.7.
3) All questions carry equal marks.

Q.1 A) Select the most correct alternative. **06**

1) According to IEEE, the microwave frequency range of Ku-band is
   a) 4 to 8 GHz b) 8 to 12 GHz
   c) 12 to 18 GHz d) 18 to 26 GHz

2) The following waves do not exist in waveguides
   a) TM waves b) TEM waves
   c) TE waves d) TE and TM waves

3) The periodic fluctuations of current passing through the n-type GaAs was discovered by
   a) J. B. Gunn b) R. C. Johnson
   c) B. C. DeLoach d) B. G. Cohen

4) The two cavity Klystron is operated on the principle of
   a) velocity modulation b) velocity and current modulation
   c) current modulation d) none of the above

5) A microstripline is also called as
   a) open-strip line b) closed-strip line
   c) mismatch line d) none of the above

6) The characteristic impedance of a rectangular waveguide is
   a) 50 Ohms b) 75 Ohms
   c) 100 Ohms d) 300 Ohms

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) The Gunn diode is always operated in the negative resistance region.
4) A line terminated in its characteristic impedance has a standing wave ratio of unity.
5) The impedance matching is very desirable in transmission line.
6) The passive elements used to control the amount of microwave power in a transmission line are called as attenuators.
7) The EM wave inside a waveguide can have an infinite number of patterns called modes.
8) In wave polarization, the orientation of electric field changes.

Q.2	**Write short notes.**		**14**
	a)	Maxwell's Equations	**05**
	b)	Gunn effect	**05**
	c)	Waveguide attenuators	**04**
Q.3	**a)**	Derive the wave equations with the help of Maxwell's equations.	**10**
	b)	Give an account on boundary conditions.	**04**
Q.4	**a)**	Derive the equations transmission coefficient and reflection coefficient.	**08**
	b)	Derive an expression for velocity modulation in klystron.	**06**
Q.5	**a)**	Discuss in detail, the various coaxial and stripline components.	**10**
	b)	Give an account on impedance matching.	**04**
Q.6	**a)**	Derive equations for losses in coaxial lines.	**10**
	b)	Write note on standing wave ratio.	**04**
Q.7	**a)**	With a neat sketch, explain the construction and working of phase shifters.	**08**
	b)	Write a note on wave propagation in perfect insulators.	**06**

SLR-UR-582

Seat No.		Set	P

M.Sc. (Semester - IV) (Old) (CBCS) Examination Mar/Apr-2018
Physics (Applied Electronics)
MICROPROCESSORS & INTERFACING

Time: 2½ Hours. Max. Marks: 70

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) All the functions of the ports of 8255 are achieved by programming the bits of an internal register called
   a) data bus control b) read logic control
   c) control word register d) none of these

2) If A1=0, A0=1 then the input read cycle is performed from
   a) port A to data bus b) port B to data bus
   c) port C to data bus d) CWR to data bus

3) The procedure of algorithm for interfacing ADC contain
   a) ensuring stability of analog input
   b) issuing start of conversion pulse to ADC
   c) reading digital data output of ADC as equivalent digital output
   d) all of the mentioned

4) In control word format of 8253, if RL1=1, RL0=1 then the operation performed is
   a) read/load least significant byte only
   b) read/load most significant byte only
   c) read/load LSB first and then MSB
   d) read/load MSB first and then LBS

5) The number of inputs that can be connected at a time to an ADC that is integrated with successive approximation is
   a) 4 b) 2
   c) 8 d) 16

6) Which of the following is not a type of DAC
   a) weighted resistor b) successive approximation
   c) R-2R Ladder d) none of these

7) In mode 2 of 8253, if N is loaded as the count value, then after (N-1) cycles, the output becomes low for
   a) 1 clock cycle b) 2 clock cycles
   c) 3 clock cycles d) 4 clock cycles

8) The sensor RAM acts as 8-byte first-in-first-out RAM in
   a) keyboard mode
   b) strobed input mode
   c) keyboard and strobed input mode
   d) scanned sensor matrix mode

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

1) In control word register of 8253, if SC1=1 and SC0=1, then the counter 1 is selected.
2) The scanned keyboard special error mode is programmed using end interrupt/error mode set command. This mode is valid only under the N-key rollover mode.
3) In mode 2 of 8255, port A is only used in bidirectional.
4) The PIC 8259 has four ICWs.
5) IF A1=1 and A0 = 1 the PORT A is selected from 8255.
6) The 8085 has five hardware and eight software interrupts.

Q.2	**a)**	Explain R-2R Ladder type of DAC.	**05**
	b)	Draw and explain the control word format of 8255.	**05**
	c)	Explain the features of 8259.	**04**
Q.3	**a)**	Interface 4K x 4 RAM to 8085. Determine its initial and final address.	**08**
	b)	Explain the pulse/rate generation mode of 8253.	**06**
Q.4	**a)**	Interface DAC1408 to 8085 through 8255. Write assembly language program to generate a triangle wave.	**08**
	b)	With the help of suitable block diagram explain successive approximation type ADC.	**06**
Q.5	**a)**	Draw and Explain the block diagram of 8279.	**08**
	b)	Explain the hardware interrupts of 8085.	**06**
Q.6	**a)**	Interface the 8255 to 8085 in I/O mapped I/O. Consider the address of PORT A=40H. Describe the address decoding logic used for chip selection.	**08**
	b)	Draw the block diagram of PIC8259.	**06**
Q.7	**a)**	Interface 8253 to 8085. What are the different operating modes of 8253, explain any one.	**08**
	b)	Explain the different operating modes of 8279.	**06**

SLR-UR-583

Seat No.		Set	P

M.Sc. (Semester - IV) (Old) (CBCS) Examination Mar/Apr 2018
Physics (Applied Electronics)
FIBER OPTIC COMMUNICATIONS

Time: 2½ Hours. Max. Marks: 70

Instructions: 1) Q.1 and Q.2 are compulsory.
2) Solve any three questions from Q.3 to Q.7.
3) All questions carry equal marks.

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

1) 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

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

3) The requirement of detector is _____
   a) High fidelity b) Small size
   c) Low bias voltage d) All of above

4) Multimode graded index fibers tend to have _____ core diameters than multimode step index fibers.
   a) Smaller b) Greater
   c) Varying d) Constant

5) The transmission distance up to which a fiber optic link will work well is dependent greatly on three fiber parameters, namely the numerical aperture (NA) _____ and attenuation.
   a) Dispersion b) Cladding size
   c) Material used for cladding d) Core size

6) The _____ is directly proportional to the quantum efficiency at a particular wavelength.
   a) attenuation b) responsivity
   c) dispersion d) quantum efficiency

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

1) Multipath dispersion does not exist in a Single mode fiber.
2) The ray possesses trough the axis of the fiber core is called meridional ray.
3) Impact ionization phenomenon occurs in PN photodiode.
4) The cutback or differential method use to measure refractive index profile.
5) Light signal trough optical fiber attenuates due to radiation losses only.
6) Stimulated Brillouin scattering may be regarded as the modulation of light through thermal molecular vibration within the fiber.
7) Edge emitting LED has greater temperature dependence then surface emitting LED.
8) LASER works on absorption principle only.

Q.2 Write short notes:

	a)	Phase velocity and group velocity of optical fiber	**05**
	b)	Working principle of LASER	**05**
	c)	Principle of p-i-n photodiode.	**04**
Q.3	**a)**	With the help of diagram, explain step index and graded index fibers.	**08**
	b)	Explain a typical experimental arrangement for the measurement of spectral loss in optical fiber using the cutback technique.	**06**
Q.4	**a)**	Define quantum efficiency and responsivity of a photodetector. Derive expression for responsivity of an intrinsic photodetector in terms of efficiency and wavelength of incident radiation of device.	**08**
	b)	Explain characteristics of injection LASER.	**06**
Q.5	**a)**	Explain the effect of dispersion in different types of optical fiber with neat diagram.	**08**
	b)	Explain the experimental setup for the near field scanning measurement of the refractive index profile.	**06**
Q.6	**a)**	A p-n photodiode has aquqntum efficiency of 50% at the wavelength of 0.9μm. Calculate: 1) Its responsivity at 0.9μm 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)	With diagram, explain vapour phase deposition techniques.	**06**
Q.7	**a)**	The velocity of the light in the core of a step index fiber is $2.01X10^{8}$ ms^{-1}, & critical angle at the core cladding interface in 80^{o}. Determine the numerical aperture & acceptance angle for the fiber in air, assuming it has a core diameter suitable for consideration for ray analysis.	**08**
	b)	Explain advantages of Fiber optic communication.	**06**

SLR-UR-665

Seat No.		Set	P

M.Sc. (Semester - IV) (Old) (CGPA) Examination Mar/Apr-2018
Physics (Applied Electronics)
COMPUTATIONAL METHODS AND PROGRAMMING

Time: 2½ Hours Max. Marks: 70

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

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

1) In solving a set of simultaneous ordinary differential equations by 4^{th} order Runge kutta method, if $y(0) = 1, h = 0.1, k_1 = 0.2, k_2 = 0.2150$, $k_3 = 0.2171$ and $k_4 = 0.2359$ then value of $y(0.1) =$?
   a) 1.2066 b) 1.1618
   c) 0.2166 d) 0.3616

2) Using the principle of least square, second normal equation of the curve $y = ce^{dx}$ will be
   a) $\sum log\ y = n \sum log\ c + d \sum log\ x$
   b) $\sum y = n \sum c + d\ log\ x$
   c) $\sum log\ y = n \sum c + d \sum log\ x$
   d) $\sum x\ log\ y = n \sum log\ c + d \sum x^2$

3) The Newton's Backward difference formula is most suitable for the case where independent variable is present at
   a) Lower part b) Upper part
   c) Central part d) Anywhere in the difference table

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

5) Using Bisection method the (n)th approximation formula for the real root of the equation $h(x) = 0$ is given by _____.
   a) $\frac{x_n + x_{n-1}}{3}$ 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) Predictor Corrector Method is used for
   a) Solving integral equations b) Solving Differential equation
   c) Evaluating integrals d) Differentiation

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

1) 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.
2) To fit the straight line $y = c + xa$ to N observations, the normal equations are $\sum y = a \sum x + c \sum x$; $\sum xy = a \sum x^2 + c \sum x$
3) The value of $I = \int_0^1 x\ dx$ by Simpson's $3/8^{th}$ rule is 0.125.
4) The principle of least square is based on Maximizing the $\sum E_i$, where $E_i = (y_i - y)^2$.

5) The positive real root of the equation $5x^3 - 3x - 1 = 0$ lies between 0 and 1.
6) To predict Adam's method at least 2 values of y, prior to the desired values re required.
7) Gauss Jordan method for solving the system $CX = B$ fails if matrix C is identity matrix.
8) Matrix inversion method is an direct Method.

Q.2 Write short notes on:

a) Write a note on Quadratures and explain how to arrive at Trapazoidal Rule. **05**

b) Write a note on need of numerical solution of the Ordinary differential equations. **05**

c) Write a note on control statements-if, if-else, do-while in C programming. **04**

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

b) Using Taylor series method, find y 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 $I = \int_0^1 \frac{dx}{x^2+1}$ 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 $y = ce^{ax}$ 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 values of c and d.

b) Solve the system of equation by pivotal condensation method, **06**

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

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 Jordan method. **06**

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

Q.7 a) Evaluate $\int_0^{0.8} e^{-t^2} dt$, using Simpsons three eight rule. **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**