Government College of Engineering, Amravati

(An Autonomous Institute of Government of Maharashtra)

First Year B. Tech. Winter 2016 CT-II

Course Code: SHU-102 Course Title: Applied Physics Nov 9, 2016 Time: 1 hr Max. Marks: 15

Q. 1. Solve any one 4

a. Derive Schrödinger's time dependent equation. 4

b. Explain construction and working of He-Ne Laser.

Q. 2. Choose correct answers from given choices 1

a. De broglies principle is applicable for

(i) +ve charged particles (ii) neutral particles (iii) -ve charged particles (iv) all of above 1

b. In optical fiber relation between RI of core n_1 & of cladder n_2

(i) $n_1=n_2$ (ii) $n_1>n_2$ (iii) $n_1<n_2$ (iv) ii & iii 1

c. The relation between group velocity Vg & phase velocity Vp is

(i) Vp>Vg (ii) Vp=Vg (iii) Vg>Vp (iv) None of all 1

d. In optical fiber the exact relation between NA & Δ is

(i) $NA^2= n_1 \times 2\,\Delta$ (ii) $NA= n_1^2 \times 2\,\Delta$ (iii) $NA^2= n_1^2 \times 2\,\Delta$ (iv) $NA= n_1 \times 2\,\Delta$ 1

e. The lasing action is due to

(i) Spontaneous emission (ii) Stimulated emission (iii) Induced absorption (iv) ii & iii

Q. 3. a. Calculate critical angle & acceptance angle for a step index optical fiber having cladding & core refractive index 1.54 &1.49 respectively. 3

b. Find first three energy levels for a proton in one dimensional potential well of length 2Å. 3

($mp = 1.67\times10^{-27}$ kg)

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GOVERNMENT COLLEGE OF ENGINEERING, AMRAVATI

Department of Physics

Class Test 2 (Semester II 2016-17)

Course: Applied Physics (SHU 102) March 20 , 2016

Duration: 1 Hr. Max. Marks: 15

Q 1. Solve any two (4 marks each)

a) Deduce Schrödinger's wave equation in time dependent form.

b) Obtain an expression for Numerical Aperture in optical fiber.

c) State Heisenberg's Uncertainty Principle and verify it experimentally.

Q 2. Explain construction and working of He-Ne LASER. (4m)

Q 3. Find De-Broglie's wavelength for electron subjected with a potential difference of 24 kV. (3m)

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GOVT. COLLEGE OF ENGINEERING, AMRAVATI

(An Autonomous Institute of Govt. Of Maharashtra)

DEPARTMENT OF PHYSICS

Class Test 2 (SEM I 2015-16)

Course: Physics (SHU102) Oct 16, 2015

Time: 03.00 to 04.00 pm Max Marks: 15

Q1.	**Attempt any three of the following**	12
(a)	Explain energy band diagram of intrinsic semiconductor. Prove that the Fermi level lies at the middle of the band gap.	
(b)	What is Hall effect? Derive the relation for V_H & R_H.	
(c)	Explain construction & working of He-Ne LASER.	
(d)	Discuss any four applications of optical fibers.	

P.T.O.

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GOVT. COLLEGE OF ENGINEERING, AMRAVATI

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DEPARTMENT OF PHYSICS

Class Test 2 (SEM II 2013-14)

Course: Applied Physics (SHU102) March 4, 2014

Time: 04.30 to 05.30 pm Max Marks: 15

Q1.	**Attempt any three of the following**	12
(a)	Explain with neat labeled diagram the energy level splitting and band configuration in silicon crystal.	
(b)	Describe an experiment to determine the concentration of current carriers in a solid. Draw neat sketch of experimental arrangement. Derive the formula required for computation of current carriers in a p-type semiconductor	
(c)	Explain Heisenberg's uncertainty principle with experimental illustration.	
(d)	An electron is moving with a speed of 500 *m/s* with an accuracy of 0.0065%. Calculate the certainty with which we can locate the position of electron.	

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Q2.	Attempt any one.	3
a)	A beam of monochromatic light of wavelength 5500 Å falls normally on a glass wedge with wedge angle of 35 seconds of an arc. If refractive index of glass is 1.45, find the number of dark fringes per cm of the wedge length.	
(b)	Calculate the least thickness of a calcite plate which would convert plane polarized light into circularly polarized light. (Given: $\lambda = 5890$ Å, $\mu_e = 1.486$, $\mu_o = 1.658$)	

$$\beta = \frac{\lambda}{2\mu\theta} \qquad \theta = 35'' \qquad \theta = \left(\frac{\pi}{180 \times 60 \times 60} \times 35\right)$$

$$N = \frac{1}{\beta} = \frac{2\mu\theta}{\lambda}$$

Q2.	**Attempt any one.**	3
(a)	In a solid, consider the energy level lying 0.02 *eV* below Fermi level. What is the probability of this level not being occupied by an electron? (Given kT=0.026 *eV*)	
(b)	An n-type germanium sample has a donor density of $10^{21}/m^3$. It is arranged in a Hall experiment having magnetic field of 0.5 *T* and the current density is 500 A/m^2. Find the Hall voltage if sample is 3 *mm* wide	

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Q2.	**Attempt any one.**	3
(a)	In intrinsic semiconductor, the electron and hole mobilities are 0.36 & 0.17 $m^2/v.s$. Find its resistivity. (given: $n_i = 2 \times 10^{19}/m^3$)	
(b)	Numerical aperture of a fibre is 0.5 and core refractive index is 1.48. Find cladding refractive index and acceptance angle.	

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GOVERNMENT COLLEGE OF ENGINEERING, AMRAVATI

(An Autonomous Institute of Govt. Of Maharashtra)

Department of Physics

Class Test 2 (Sem II 2015-16)

urse: Applied Physics (SHU 102) **March 09, 2016**

ne: 03.00 to 04.00 pm **Max. Marks: 15**

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e 1. Solve any two (04 marks each)

a) Deduce Schrödinger's wave equation in time independent form.

b) What is acceptance cone and obtain an expression for Numerical Aperture in optical fiber.

c) Explain Absorption, Spontaneous emission and stimulated emission in case of LASER.

ıe 2. Discuss applications of LASERS in detail (any two) & what are the advantages of optical fiber. (04)

ıe 3. Find energy of the electron in ground state in one dimensional potential well of length 1 A^0. (03)

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