Code: 15A56101 **R15**

B.Tech I Year I Semester (R15) Supplementary Examinations June 2017

ENGINEERING PHYSICS

(Common to CE, EEE & CSE)

Time: 3 hours Max. Marks: 70

PART - A

(Compulsory Question)

Note: Physical constants: Planck's constant: $h = 6.63 \times 10^{-34}$ Js,
Mass of the electron = 9.1 x 10^{-31} kg, Charge of the electron = 1.6 x 10^{-19}C
Boltzmann's constant k_B = 1.38 x 10^{-27} JK^{-1}, Permeability of free space $\mu_0 = 4\pi \times 10^{-7}\ Hm^{-1}$

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1 Answer the following: (10 X 02 = 20 Marks)

(a) State working principle of semiconductor diode laser.
(b) What is diffraction? What is the impact of increasing number of slits on diffraction pattern ?
(c) List different types of crystal systems.
(d) Draw the block diagram of non-destructive testing of specimen.
(e) Give two reasons to prove that the matter waves are not electromagnetic waves.
(f) Represent graphically the probability distribution of electrons in metal at T = 0 K and $T > 0K$.
(g) Draw the energy band diagram of extrinsic semiconductor and represent the position of Fermi level.
(h) What are the origins for the magnetic moment in an atom?
(i) What is Josephson effect? Write any two applications.
(j) How does top-down approach different from bottom-up approach?

PART - B

(Answer all five units, 5 X 10 = 50 Marks)

UNIT - I

2 Derive an expression for energy density of radiation in terms of Einstein's A & B coefficient for two level systems & obtain the condition for laser action.

OR

3 (a) What is fiber loss? Mention the factors for the fiber loss and explain them briefly.

(b) An optic glass fiber of refractive index 1.50 is to be clad with another glass to ensure total internal reflection that will contain light travelling within 5° of the fiber axis. What maximum index of refraction is allowed for the cladding?

UNIT - II

4 With neat diagram, explain the construction and working of Debye-Scherer method (powder method) and discuss how to determine interplanar spacing of the crystal.

OR

5 (a) What are ultrasonic waves? Mention their properties and applications.

(b) The results of the X-ray diffraction investigation shows that, for a given crystal, two successive orders of reflection maxima occurs at the glancing angle of $8°58^{l}$ and $12°1^{l}$. Evaluate the order of reflection corresponding to the glancing angle of $18°12^{l}$.

Contd. in page 2

Code: 15A56101

R15

UNIT - III

6 (a) Setup time-independent Schrodinger wave equation of a particle in motion.

(b) Calculate the wavelength associated with an electron subjected to a potential difference of 1.25 kV.

OR

7 (a) What is energy bond? Explain the formation of energy bond due to the interaction of atoms in sodium metal.

(b) Calculate the probability of an electron occupying an energy level 0.02 eV above the Fermi level at 200 K in a metal.

UNIT - IV

8 (a) What are hard and soft magnetic materials? Mention their properties based on hysteresis loop and mention the applications.

(b) Diamagnetic material Al_2O_3 is subjected to an external magnetic field of 10^5 Am^{-1}. Evaluate magnetization and magnetic flux density in Al_2O_3. Given: Susceptibility of Al_2O_3 is 5 x 10^5.

OR

9 (a) What is drift current? Derive an expression for drift current in case of semiconductor.

(b) A silicon plate of thickness 1 mm, breadth 10 mm and length 100 mm placed in magnetic field of 0.5 Wbm^{-2} acting perpendicular to its thickness. If 10^{-2}A current flows along its length, calculate hall voltage developed if the hall coefficient is 3.66 x 10^{-4} m^3c^{-1}.

UNIT - V

10 (a) What is Meissner effect? Show that a superconductor behaves as diamagnetic material.

(b) The critical fields for sample are 1.4 x 10^5 and 4.2 x 110^5 Am^{-1} at 14K & 13K respectively. Find the transition temperature of the sample.

OR

11 (a) What are nanomaterials? Find surface-to-volume ratio when 1 cm cubical object reduces to 1 mm cubical object. Mention its significance.

(b) Discuss how the synthesis of nanomaterials is done using ball mill technique.

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