Code: 15A56101 **R15**

B.Tech I Year I Semester (R15) Regular & Supplementary Examinations December 2016

ENGINEERING PHYSICS

(Common to CE, EEE and CSE)

Time: 3 hours Max. Marks: 70

PART – A

(Compulsory Question)

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

(a) A slit of width 6.2 x 10^{-4} cm is illuminated with light of wavelength 5800 A^0. What is the angular separation between the first-order minima on either side of central maxima?

(b) What is meant by active material and metastable state in a laser?

(c) The spacing between the successive (100) planes is 2.82 A^0. X-ray incident on the surface of the crystal is found to give rise to first order Bragg reflection at glancing angle 8.8^0. What is the wavelength of X-ray?

(d) Write four applications of ultrasonics.

(e) What would be the wavelength of quantum of radiant energy emitted, if an electron transmitted in to radiation and converted into one quantum?

(f) What are the drawbacks of classical free electron theory?

(g) What is Fermi level? Mention its position in n-type and p-type semiconductors?

(h) Susceptibility of iron is more than that of copper. Why?

(i) What is Meissner effect?

(j) Why are the properties of nanoscale objects different than those of the same materials at the bulk scale?

PART – B

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

UNIT – I

2 (a) Prove that the diameter of n^{th} dark ring in a Newton's ring set-up is directly proportional to the square root of the ring number.

(b) How many lines per cm are there in a grating which gives an angle of diffraction of 30^0 in first order of light of wavelength 6 x 10^{-5} cm.

OR

3 (a) Provide a detailed description of an optical fibre-based communication system using a block diagram.

(b) A step-index fibre has a core of refractive index of 1.5. If the NA of the fibre is 0.26, calculate the refractive index of the cladding material.

UNIT – II

4 (a) Find the atomic radius in different types of cubic lattices.

(b) Calculate the wavelength of neutron beam and its speed if the spacing between successive planes is 3.84 A^0 and glancing angle is 30^0 for first order Bragg reflection. Mass of the neutron is $1.67 * 10^{-27}$kg, Planck's constant is $6.62 * 10^{-34}$j – s.

OR

5 Define piezoelectric effect. Draw a circuit diagram for the production of ultrasonic using a quartz crystal. Also explain its working.

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UNIT – III

6 By applying Schrodinger's wave equation, show that the energy of an electron confined in a 1-D potential well of length L is quantized. Discuss its wave functions.

OR

7 (a) Explain Fermi-Dirac distribution function. How does it vary with temperature?
(b) Find the temperature at which there is 1% probability that a state with energy 2 eV is occupied. Given that Fermi energy is 1.5 eV.

UNIT – IV

8 (a) What is Hall effect? How does this effect show whether holes or electrons predominate in a semiconductor?
(b) A copper strip 2 cm wide and 1 mm thick is placed in a magnetic field with B = 1.5 Wb/m^2. If a current of 200 A is set up in the strip, calculate Hall voltage that appears across the strip. Assume $R_H = 6 \times 10^{-7}\ m^3/C$.

OR

9 (a) How magnetic moment is originated? Explain.
(b) What is hysteresis curve? How hysteresis curve is used for selecting the material for the construction of a permanent magnet.

UNIT – V

10 (a) Explain a.c and d.c Josephson effect.
(b) Write in detail BCS theory of superconductivity.

OR

11 (a) What are the induced effects due to increase in surface area of nanoparticles?
(b) Explain sol-gel synthesis for producing nanomaterials with the help of a neat sketch.

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