Code: 15A56101 **R15**

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

ENGINEERING PHYSICS

(Common to IT, ECE, EIE and ME)

Time: 3 hours Max. Marks: 70

PART – A

(Compulsory Question)

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

(a) How does laser light differs from ordinary light?
(b) How the optical fibers are classified? What are they?
(c) Why X-rays are used for diffracting a crystal?
(d) What is direct and inverse piezoelectricity?
(e) What is a matter wave? What is its wavelength?
(f) What are the basic assumptions of classical free electron theory?
(g) What are the applications of hall effect?
(h) What is the relation between susceptibility and temperature in para, ferro and anti-ferro magnetic materials?
(i) Define Josephson effects in superconductivity.
(j) What is meant by top-down and bottom-up methods?

PART – B

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

UNIT – I

2 (a) How do you determine the refractive index of a given liquid using Newton rings?
(b) In a grating spectrum, which spectral line in fourth order will overlap with third order line of 5491 A^0?

OR

3 (a) Write in detail about population inversion and optical resonator.
(b) Calculate the refractive indices of the core and the cladding material of a fiber from the following data: Numerical aperture (NA) = 0.22 and Δ = 0.012, where Δ is the fractional refractive index change.

UNIT – II

4 (a) State and explain Bragg's law. What are the applications of X-ray diffraction?
(b) The inter planar spacing d_{111} in a FCC metal is 0.2355 nm. Calculate its lattice constant and atomic radius.

OR

5 (a) What are ultrasonics? What are its properties?
(b) What is non-destructive testing? Explain any one method of detecting ultrasonic waves.

UNIT – III

6 (a) Derive Schrödinger's time independent wave equation.
(b) Evaluate the momentum and energy of an electron confined in a box of length 1.0 A^0 for the ground state. Find the corresponding De Broglie wavelength.

OR

7 (a) Obtain an expression for electrical conductivity.
(b) Using the Fermi function, evaluate the temperature at which there is 1% probability that an electron in a solid will have energy 0.5 eV above E_F of 5 eV.

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UNIT – IV

8 (a) What is a drift and diffusion current? Obtain Einstein's equations.

(b) Find the Hall coefficient and electron mobility of Ge for a given sample (length 1 cm, breadth 5 mm, and thickness 1 mm). A current of 5 mA flows from a 1.35 V supply and develops a Hall voltage of 20 mV across the specimen in a magnetic field of 0.45 Wb/m^2.

OR

9 (a) Differentiate soft and hard magnetic materials.

(b) A magnetic field of 1800 A/m produces a magnetic flux of 3×10^{-5} Wb in an iron bar of cross-sectional area 0.2 cm^2. Calculate the permeability.

UNIT – V

10 (a) Explain BCS theory of superconductivity.

(b) State and explain Meissner effect.

OR

11 (a) What are the basic principles of nanomaterials?

(b) Explain any three physical properties of nanomaterials.

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