Code: 15A56101 **R15**

B.Tech I Year I Semester (R15) Supplementary Examinations June 2018

ENGINEERING PHYSICS

(Common to CE, EEE & CSE)

Time: 3 hours Max. Marks: 70

PART – A

(Compulsory Question)

*****

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

(a) Why it is difficult to achieve the laser action for higher frequency radiation such as X-rays?

(b) Define diffraction. Why the diffraction of light is not observed as evident in daily experience as that of sound waves.

(c) Draw the following in the unit cell: $(1\ \bar{1}\ 2)$, $[1\ 0\ 1]$.

(d) Compare the physical properties of BCC and FCC based on packing fraction, number of atoms.

(e) What are matter waves? Why don't we observe matter waves for the propagation of macroscopic bodies?

(f) What are the assumptions of quantum free electron theory?

(g) Distinguish direct and indirect band gap semiconductors.

(h) What are hard magnets? Mention any two applications.

(i) Draw the magnetization curve (or) graph for Type-I and Type-II superconductor.

(j) Why the properties of materials change at nanoscale?

PART – B

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

UNIT – I

2 (a) With neat energy level diagram of exited states of He – Ne system, explain the emission a laser light in the visible and infra red region.

(b) In a cavity of He – Ne layer, stimulated photons of wavelength 339 nm are produced. Find the length of resonant cavity to get the laser output, if the order of magnitude of standing waves in the cavity is 3.6×10^5.

OR

3 (a) Explain point to point optical fiber communication system with neat block diagram. Mention any two advantages and disadvantages.

(b) A glass clad fiber is made with core of refractive index 1.5 and cladding is doped to give fractional index change of 0.005. Determine external critical acceptance angle.

UNIT – II

4 (a) Derive an expression for interplanar spacing for cubic system.

(b) Calculate the glancing angle for incident X-rays of wavelength 0.058 nm on a plane (1 3 2) of NaCl which results in 2nd order diffraction maxima, taking the lattice constant as 0.381 nm.

OR

5 (a) What are ultrasonic waves? Describe ultrasonic non-destructing method used for flow detection.

(b) Determine the velocity of ultrasonic waves produced by a quartz crystal of thickness 1 mm in piezo electric oscillator. Given; Young's modulus of quartz is 7.9 x 10^{10} Nm^{-2} & density is 2650 kg/m^{-3}.

UNIT – III

6 By solving time independent Schrodinger's equation, show that the least energy possessed by a particle in a 1-diamensional potential well of width 'a' is $\frac{h^2}{8ma^2}$. Discuss why the energy of a bounded particle will not be zero.

OR

7 (a) What is Fermi factor? Discuss the probability of occupation of various energy levels by electrons of T=0K and T > 0K and represent it graphically.

(b) Find the relaxation time of conduction electrons in a metal of resistivity 1.54 x 10^{-8} Ωm. If the metal has 5.8 x 10^{28} conduction electrons per unit volume.

Contd. in page 2

Code: 15A56101 **R15**

UNIT – IV

8 (a) What is hall effect? Obtain an expression for Hall co-efficient.

(b) If mobility of electrons and holes in an intrinsic semiconductor at 300 K are 0.36 and 0.14 $m^2V^{-1}S^{-1}$ respectively, calculate the number of charge carriers. Given that the conductivity is 2.2 $r^{-1}m^{-1}$.

OR

9 (a) What are diamagnetic and ferromagnetic materials? Distinguish them with any four properties.

(b) Define Bohr magneton: Find its value.

UNIT – V

10 (a) What are superconductors? Give an account of BCS theory of superconductivity.

(b) Calculate the critical magnetic field for vanadium at 3K. Given that the critical magnetic field at 0K is 0.1 T & the critical temperature is 5K.

OR

11 What are mano-materials? Explain the synthesis of nano-materials by Solgel method. Mention the applications of nano-materials in the engineering field.

Physical constants:

Charge of the $e^- = 1.6 \times 10^{-19}c$.

*****