920

B.Tech 2nd Semester Examination

Applied Physics-II (OS)

AS-1007

Time : 3 Hours **Max. Marks : 100**

The candidates shall limit their answers precisely within the answer-book (40 pages) issued to them and no supplementary/ continuation sheet will be issued.

Note : This paper consists of five sections A, B, C, D and E. Candidates are required to attempt one question from each of the sections A, B, C and D. However section E is compulsory. All questions carry equal marks.

SECTION - A

1. (a) What are x-ray? Why x-rays are preferred for crystal structure determination? How do you determine crystal structure using x-ray power method. **(15)**

 (b) Obtain the miller indices of a plane, which intercepts of a, b/2, 3c is a simple cubic unit cell. **(5)**

2. (a) Explain quantum theory of free electrons in a box. **(15)**

 (b) What do you understand about thermionic emission? Explain. **(5)**

SECTION - B

3. (a) What is Fermi energy? How does it vary with temperature? Indicate in a diagram the location of Fermi level for p-type and n-type semiconductors. **(15)**

(15)

(b)   What are Brillouin zones? Explain.   **(5)**

4.   Give a direct proof of the motion of electrons in the band theory of solids, based on Kronig-Penney Model.   **(20)**

SECTION - C

5.   (a)   What is a photovoltaic cell? Discuss important characteristics of photovoltaic cell.   **(10)**

(b)   Explain photo conductivity. Discuss the important applications of photo conductivity.   **(10)**

6.   (a)   What is super conductivity? What do you understand by type I and type II super conductors? List the important applications of super conductors.   **(12)**

(b)   Explain classical theory of paramagnetism.   **(8)**

SECTION - D

7.   (a)   Write a short note on semi conductor laser. How population inversion can be achieved in the semiconductor laser.   **(15)**

(b)   Distinguish between spontaneous and stimulated emission of radiations.   **(5)**

8.   (a)   What are single mode and multimode fibers? Discuss important applications of fibers.   **(15)**

(b)   An optical fiber has a NA of 0.20 and a cladding refractive index of 1.59. Determine the acceptance angle for the fiber in water, which has a refractive index of 1.33.   **(5)**

SECTION - E

9. (a) What is the origin of x-rays?

   (b) What are Miller indices?

   (c) Define the terms in crystal structure study.
   (i) lattice (ii) unit cell.

   (d) What are semiconductor materials?

   (e) Explain the concept of effective mass.

   (f) With the help of a diagram explain magnetic circuit.

   (g) How it is that laser light is described as the purest and most intense?

   (h) Name four methods of pumping a laser.

   (i) Give any two assumptions of classical theory of paramagnetism.

   (j) Explain basic idea of optical fiber.   (10×2=20)