Hall Ticket No | | | | | | | | | | | Question Paper Code: AHS008

INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

B.Tech II Semester End Examinations (Supplementary) - May, 2019

Regulation: IARE – R16

MODERN PHYSICS

Time: 3 Hours **(Common to AE | ME | CE)** **Max Marks: 70**

Answer ONE Question from each Unit
All Questions Carry Equal Marks
All parts of the question must be answered in one place only

UNIT – I

1. (a) Describe in detail the structure of the of BCC by calculating its i) Number of atoms per unit cell, ii) Lattice constant, iii) Coordination number and iv) Atomic packing factor. **[7M]**

   (b) Calculate the volume of an FCC unit cell in terms of the atomic radius R; also show that the atomic packing factor for the FCC crystal structure is 0.74 with suitable diagrams. **[7M]**

2. (a) Explain Miller indices with suitable example. List the steps to be followed to find the Miller indices of a plane **[7M]**

   (b) Draw a [120] direction within a unit cell. Identify the Miller indices and draw the planes within a unit cell that are parallel to X & Y axis, Y & Z axis, Z & X axis. **[7M]**

UNIT – II

3. (a) Describe in detail Debey – Scherrer(powder) method for the determination of crystal parameter. **[7M]**

   (b) X-rays of wavelength $1.5418A^o$ are diffracted by (111) planes in a crystal at an angle 30^o in the first order. Calculate the interatomic spacing. **[7M]**

4. (a) Line defects can be classified into edge and screw dislocations. Discuss these dislocations with suitable diagrams. **[7M]**

   (b) If the average energy to create a vacancy in a metal is 1 eV, calculate the ratio of vacancies in the metal at 1000 and 500 K. **[7M]**

UNIT – III

5. (a) What is a LASER? Explain the terms absorption, spontaneous emission and stimulated emission with the help of a energy level diagram. **[7M]**

   (b) In what way a LASER is different from other light sources. For a He – Ne LASER at 1 m and 2 m distances from the LASER output beam spot diameters are 4 mm and 6 mm respectively. Calculate the divergence. **[7M]**

6. (a) What is optical sensor? Explain the construction and working of any one optical sensor with a neat sketch. **[7M]**

   (b) A semiconductor diode laser has a wavelength of 1.55μm. Find its band gap in eV. **[7M]**

UNIT – IV

7. (a) Define of total internal reflection. Explain any four advantages of optical fibre communication system over traditional communication system. **[7M]**

   (b) A silica optical fibre has a core of refractive index 1.50 and a cladding of fraction index of 1.47. Determine (i) Critical angle at the core cladding interface, (ii) The numerical aperture for the fibre and (iii) Acceptance angle in air for the fibre. **[7M]**

8. (a) Explain the working of singlemode and multimode optical fibres with suitable sketches. **[7M]**

   (b) List any four differences between single mode and multimode optical fibre. For a multimode step index fibre with a glass core (n1 = 1.5) and a fused quartz cladding (n2 = 1.46), determine the critical angle.

   [7M]

UNIT – V

9. (a) With suitable diagram derive the expression for interference in thin films due to reflection. **[7M]**

   (b) List the conditions for sustained interference pattern. A parallel beam of light λ=5890^{0}A, is incident on a glass plate (μ=1.5) such that angle of refraction in to plate is 60^0 .Calculate the thickness of the plate.

   [7M]

10. (a) Explain Fraunhofer diffraction at a single slit. **[7M]**

    (b) What is a grating element? A parallel beam of light is incident normally on a plane grating having 4300 lines/cm. A second order spectral line is found to be deviated through an angle of 30^o. Determine the wavelength of the spectral line. **[7M]**

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