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

INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

B.Tech II Semester End Examinations (Supplementary) - July, 2018

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) Explain the seven types of crystal system with neat diagrams **[7M]**
   (b) Derive an expression for the interplanar spacing of a crystal in terms of Miller indices. **[7M]**
2. (a) Show that diamond cubic structure is the most loosely packed structure than other cubic structures by calculating the packing fraction.. **[7M]**
   (b) Show that the maximum radius of the sphere that can just fit into the void at the body center of FCC structure coordinated by the facial atoms is 0.414r where r is the radius of the atom. **[7M]**

UNIT – II

3. (a) State Bragg's law. Explain with suitable diagram, the Laue's method of determination of crystal structure. **[7M]**
   (b) X-rays of wavelength 1.541 are diffracted by (111) planes in a crystal at an angle 30^0 in the first order. Calculate the interatomic spacing **[7M]**
4. (a) Derive an expression for the number of vacancies at a given temperature **[7M]**
   (b) The fraction of vacancies in a metal is 1×10^{-10} at 500^0C. What will be the fraction of vacancy sites at 1000^0C. **[7M]**

UNIT – III

5. (a) What is laser? Explain the three major applications of laser. **[7M]**
   (b) Explain the two conditions for laser action. A ruby laser emits a pulse of 20ns duration with average power per pulse being 100 KW. If the numbers of photons in each pulse is 6.98 x 10^{-14}, calculate the wavelength of photons. **[7M]**
6. (a) Explain the working of a pressure sensor with a diagram. **[7M]**
   (b) What are active and passive sensors? What are the advantages of optical fiber sensors? **[7M]**

UNIT – IV

7. (a) Derive the expression for numerical aperture in an optical fibre with neat figure. **[7M]**
   (b) What are the advantages and disadvantages of the optical fibers. . **[7M]**

8. (a) Explain fiber optical communication system with block diagram. **[7M]**

   (b) The numerical aperture of an optical fiber is 0.39. If the fractional difference in the refractive indices is 0.05 calculate the refractive indices of core and cladding. **[7M]**

UNIT – V

9. (a) Derive the expression for intensity of Fraunhofer diffraction at single slit. **[7M]**

   (b) What are Newton's rings? In Newton ring experiment, the diameters of the 4th and 12th dark rings are 0.4 cm and 0.7 cm respectively. Find the diameter of the 20th dark ring. . **[7M]**

10. (a) Distinguish between Fresnel and Fraunhofer diffractions. In Fraunhofer diffraction due to a single slit explain the resultant intensity distribution **[7M]**

    (b) In a grating show that only first order is possible if the width of the grating element is less than twice the wavelength of light. **[7M]**

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