

B.E./B.TECH. Degree Examination, December 2020

First Semester

PH16151- Engineering Physics I

(Regulation 2016)

Time: Three hours

Maximum :80 Marks

Answer **ALL** questions**PART A - (8 X 2 = 16 marks)**

1. The atomic diameter of an BCC crystal (if 'a' is the lattice parameter) is
(a) $\sqrt{3}a$ (b) $\sqrt{3}a/2$ (c) $\sqrt{3}a/4$ (d) $\sqrt{3}a/8$
2. A wooden spoon is dipped in a cup of ice cream, the other end temperature is
(a) increased and decreased (b) decreased (c) increased (d) no change
3. Which Physical quantity remains unchanged when a sound travels in air or in water?
(a) Amplitude (b) Frequency (c) velocity (d) time
4. In an optical fiber, the parameter of Numerical aperture is applicable in describing the ability of
(a) Light collection (b) light scattering (c) light dispersion (d) light polarization
5. Are the Ultrasonic waves electromagnetic waves? Justify.
6. List the factors that affect the elasticity.
7. If the reverberation time is lower than the critical values, how will it affect the acoustical quality of a building?
8. There would not be any Spontaneous absorption, Why?

PART B - (4 X16 = 64 marks)

09. (a) (i) Show that in an ideal hexagonal close packed structure the c/a ratio is **(12)**
1.633 and its atomic packing factor equals to the face-centered cubic structure.
- (ii) State the conditions imposed on the cell parameters for crystal systems **(4)**
having the largest of Bravais lattices and the least number of nearest neighbours.

(OR)

- (b) (i) Explain the construction and working of a crystal growth technique that **(10)**
can be employed to grow a crystal by melt technique and discuss its advantage over solution growth technique.
- (ii) In what way single crystals differ from amorphous solids? **(6)**

10. (a) (i) Derive an expression for the depression produced at the free end of a beam when the other end is rigidly fixed. Assuming the weight of the beam is negligible. (12)
- (ii) A circular and a square cantilever are made of same material and have equal area of cross-section and length. Find the ratio of their depressions for a given load. (4)

(OR)

- (b) (i) Consider the boilers made up of different layers of conducting materials. How the heat conduction takes place in such an arrangement when they are connected in series and parallel? (12)
- (ii) Two bars of copper and steel of length 1.0m and 0.5m and coefficient of thermal conductivity $400\text{Wm}^{-1}\text{K}^{-1}$ and $50\text{Wm}^{-1}\text{K}^{-1}$ respectively are joined end to end. The free ends of copper and steel are maintained at 100°C and 0°C respectively. Calculate the temperature of copper-steel junction if both bars have the same area of cross-section. (4)

11. (a) Derive an expression for the change in wavelength suffered by an X-ray Photon when it collides with an electron and describe the experimental part with necessary diagrams. (16)

(OR)

- (b) Derive expressions for growth and decay of energy density inside a hall and hence deduce expression for the reverberation time of the hall. (16)
12. (a) (i) Explain with neat diagram the process of absorption of light, spontaneous emission and stimulated emission of light. What are the necessary conditions for their occurrence? Why spontaneous emission predominates the stimulated emission at normal temperature? (14)
- (ii) Why population inversion is necessary for laser action? (2)

(OR)

- (b) (i) Explain in detail how optical fibers are classified according to the material, refractive index and modes of propagation. (14)
- (ii) What is the Numerical aperture of a fiber, which has a relative refractive index difference of 0.05 and a core refractive index of 1.5? (2)