Reg. No. : | | | | | | | | | | | | |

Question Paper Code : 22092

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2015.

First Semester

Civil Engineering

PH 2111/PH 13/080040001 — ENGINEERING PHYSICS — I

(Common to All Branches)

(Regulations 2008)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. What is meant by SONAR?

2. What is acoustic grating?

3. What is atomic transition?

4. Write any four applications of laser in medical field.

5. Calculate the numerical aperture of an optical fiber whose core and cladding are made of materials of refractive index 1.6 and 1.5 respectively.

6. What is splicing?

7. Arrive at Rayleigh-Jeans law from Planck's law.

8. What is the physical significance of a wave function?

9. Define unit cell.

10. A crystal of BCC structure has atomic radius 1.2 Å. Find the volume of its unit cell.

PART B — (5 × 16 = 80 marks)

11. (a) (i) Describe the construction and working of a magnetostriction oscillator to produce ultrasonic waves. (6+6)

(ii) Calculate the frequency of the fundamental note and the first over tone emitted by a Piezoelectric crystal, using the following data. Given l = 5 mm. Young's modulus Y=7.9 × 10^{10} N/m^2 and density = 2650 kg/m^3. (4)

Or

(b) (i) Describe the method of determining the velocity of ultrasonic waves using acoustic grating. (12)

(ii) Explain the medical applications of ultrasonic waves. (4)

12. (a) (i) Distinguish between spontaneous emission and stimulated emission of radiation. (4)

(ii) For atomic transitions, derive Einstein relations and hence deduce the expression for the ratio of spontaneous emission rate to the stimulated emission rate. (12)

Or

(b) (i) Describe the construction and working of Nd-YAG laser with energy level diagram. (12)

(ii) Explain laser welding. (4)

13. (a) Define acceptance angle and numerical aperture. Derive an expression for angle of acceptance and numerical aperture of fibre in terms of refractions index of the core and cladding of the fibre. (4+12)

Or

(b) (i) Distinguish between step index and graded index fibres. (4)

(ii) Explain with a neat block diagram, the working of fibre optical communication system. (12)

14. (a) Give the theory of Compton effect and briefly explain its experimental verification. (10+6)

Or

(b) (i) Calculate the values of the energy of a particle in a one dimensional box. (12)

(ii) Calculate the energy difference between the lowest state and the first energy of an electron moving in one dimensional in an infinitely high potential box of width 0.1 nm. (4)

15. (a) Describe a HCP structure. Show that for an HCP structure $\frac{c}{a}=\sqrt{\frac{8}{3}}$ and hence calculate the packing fraction for the HCP structure. (4+8+4)

Or

(b) Explain in detail the crystal defects and their types. (16)

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