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Question Paper Code : 72092

B.E./B.Tech. DEGREE EXAMINATION, APRIL/MAY 2015.

First Semester

Civil Engineering

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

(Common to All Branches)

(Regulation 2008)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. What is inverse piezo- electric effect?

2. What is cold working?

3. Give any four applications of laser in industry.

4. Why is a four level laser preferred compared to three level laser.

5. Calculate the numerical aperture for an optical fibre immersed in water with a core index of 1.56 and cladding index of 1.52. (Refractive index for water is 1.33)

6. How does an optical fibre work as a temperature sensor?

7. What is the basic principle of scanning electron microscopy?

8. What is Compton wavelength? Does it depend on the wavelength of the source?

9. What are Miller indices? Write the steps to find Miller indices.

10. Why is diamond insulator and graphite a conductor?

PART B — ($5 \times 16 = 80$ marks)

11. (a) (i) What is magnetostriction effect? With a neat circuit diagram, describe the production of ultrasonic waves by magnetostriction method. (10)

(ii) Explain with a block diagram the sonogram technique used to study the movement of heart. (6)

Or

(b) (i) Explain the principle of working of Ultrasonic flaw detector with a block diagram. Also explain the different modes of display in use. (10)

(ii) What is acoustic grating? Explain how it can be used to determine the velocity of ultrasound in liquids. (6)

12. (a) (i) Explain the process of spontaneous emission and stimulated emission. Derive Einstein's co-efficients and hence find the ratio between rate of spontaneous emission and stimulated emission. (12)

(ii) Find the ratio of rate of spontaneous emission to rate of stimulated emission for a sodium vapour lamp that emits light of wavelength 589.3 nm at 500 K. (4)

Or

(b) (i) With necessary theory explain the construction and working of CO_2 laser. Explain the role of He and N_2 in CO_2 laser. (12)

(ii) A laser diode is fabricated from a semiconducting material having a direct band gap of 2.25 eV. Find the colour of the light that will be emitted by the laser diode in operation. (4)

13. (a) (i) Explain fibre optic communication system with a neat block diagram. Give its advantages. (8)

(ii) Explain with a neat sketch the double crucible method of drawing optical fibres. (8)

Or

(b) (i) What are attenuation and dispersion losses in optical fibres. Explain how these losses are minimized. (8)

(ii) Explain the construction and working of fibre optic medical endoscopy and its applications. (8)

14. (a) (i) Solve Schrodinger wave equation for a free particle in a one-dimensional box and find its energy values. (12)

(ii) X-rays of wavelength $\lambda = 0.2\ nm$ are scattered from a block of graphite. The scattered X-rays are observed at an angle of 45° to the incident beam. Calculate the wavelength of the X-rays scattered at this angle. Find the fraction of energy lost by the photon in this collision. (4)

Or

(b) (i) Derive Planck's radiation law and explain the energy spectrum of a blackbody. (12)

(ii) Calculate the minimum energy of a neutron confined to a one-dimensional potential well of width $10^{-14}\ m$. (Mass of neutron $= 1.672 \times 10^{-27}$ kg). By how much does this minimum energy change if neutron is replaced by a proton? (4)

15. (a) (i) Describe BCC and FCC structures and calculate the atomic radius and packing factor. (12)

(ii) Explain polymorphism and allotropy. (4)

Or

(b) (i) What are Bravais lattices? Describe the same for a 3-dimensional space. (8)

(ii) Describe with suitable diagrams the edge and screw dislocations in a crystal. (8)
