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Question Paper Code : 10471

B.E./B.Tech. DEGREE EXAMINATION, MAY/JUNE 2012.

First Semester

PH 2111/182101/PH 13/0800040001 – 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. A quartz crystal of thickness 1 mm is vibrating at resonance. Calculate the fundamental frequency. The Young's modulus and the density of quartz are $7.9 \times 10^{10} \text{ N.m}^{-2}$ and 2650 kg.m^{-3} respectively.
2. What is cold welding?
3. What are the conditions needed for laser action?
4. Name the properties of laser, which are making it suitable for industrial applications.
5. State the principle of propagation of light in an optical fiber.
6. Mention any two medical applications of optical fibers.
7. Find the lowest energy of an electron confined to move in a one dimensional box of length 1 \AA . Express the result in electron volts.
8. What is meant by normalization of wavefunction?
9. Name the seven crystal systems.
10. Defects in crystals are not always harmful. Justify.

PART B — (5 × 16 = 80 marks)

11. (a) (i) What are magnetostriction and piezoelectric effect? (4)
(ii) Write down the complete experimental procedure with a neat circuit diagram of producing ultrasonic waves by piezoelectric effect. (12)

Or

- (b) (i) What is an acoustic grating? How is it used in determining the velocity of ultrasound? (2 + 6)
- (ii) Explain the process of non-destructive testing of materials using ultrasonic waves by pulse-echo method. (8)
12. (a) Discuss the Einstein's theory of stimulated absorption, spontaneous and stimulated emission of radiation. What are the conditions for light amplification? (16)

Or

- (b) (i) Describe principle, construction and working of He-Ne laser with neat diagram. (10)
- (ii) Write notes on lasers in cutting, drilling and welding. (6)
13. (a) (i) Define acceptance angle and derive expressions for acceptance angle and numerical aperture. (10)
- (ii) What are the classifications of optical fibers? (6)

Or

- (b) (i) With block diagram, explain the fibre optical communication system. (10)
- (ii) Describe the construction and working of a fibre optic temperature sensor. (6)
14. (a) Derive an expression for Planck's radiation law and discuss the same for shorter and longer wavelength. (16)

Or

- (b) Discuss the construction, working and applications of scanning electron microscope. (16)
15. (a) (i) What are Miller indices? Mention the steps involved to determine the Miller indices with example. (2 + 4)
- (ii) The material zinc has HCP structure. If the radius of the atom is $\frac{1}{4}$ th of the diagonal of hexagon, calculate the height of the unit cell in terms of atomic radius. (2)
- (iii) Show that the packing factor for HCP is 74%. (8)

Or

- (b) (i) Define the terms polymorphism and allotropy. (2)
- (ii) Explain in detail the crystal defects and their types. (14)