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Question Paper Code : 51014

B.E./B.Tech. DEGREE EXAMINATIONS, JANUARY 2012.

First Semester

PH 2111 — 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 are direct and inverse piezoelectric effects?
2. Give the principle used in measurement of velocity of blood flow.
3. What is meant by population inversion?
4. Name the properties of laser, which are making it suitable for industrial applications.
5. A fibre cable has an acceptance angle of 30° and a core index of refraction of 1.4. Calculate the refractive index of the cladding.
6. What are the main requirements of light sources used in fiber optic communication?
7. What is Rayleigh-Jean's law of radiation?
8. For a free particle moving within a one dimensional potential box, the ground state energy cannot be zero. Why?
9. A unit cell has the dimensions $a = b = c = 4.74 \text{ \AA}$ and $\alpha = \beta = \gamma = 60^\circ$. What is its crystal structure?
10. Defects in crystals are not always harmful. Justify.

PART B — (5 × 16 = 80 marks)

11. (a) (i) Explain the functions of SONAR. (4)
(ii) What is an acoustic grating? (3)
(iii) How is it used in determining the velocity of ultra sound? (9)

Or

- (b) Elaborate on the three different ultrasonic NDT scans and their displays which are in common practice. (16)
12. (a) (i) Distinguish between spontaneous and stimulated emissions of radiation. (4)
(ii) Why is population inversion necessary for laser action? (4)
(iii) What are different pumping mechanisms used in lasers? Give an example for each. (8)

Or

- (b) (i) Discuss the construction and working of a Nd : YAG laser. (8)
(ii) What are its advantages? (3)
(iii) Explain any two industrial applications of lasers. (5)
13. (a) (i) Explain total internal reflection with suitable diagrams. Define acceptance angle and numerical aperture. Derive expressions for them. (2 + 4 + 4)
(ii) How are optical fibers classified based on modes and refractive index profile? How are signals transmitted through them? (6)

Or

- (b) (i) What is meant by attenuation? Discuss the different mechanisms which are responsible for attenuation in the optical fiber. (2 + 8)
(ii) Explain the working of a displacement sensor in detail. (6)
14. (a) Using Quantum theory derive an expression for the average energy emitted by a black body and arrive at Planck's radiation law in terms of frequency. State the assumptions before starting the derivation. (16)

Or

- (b) What is the principle of transmission electron microscope? Draw the construction of transmission electron microscope and explain its working. Give its advantages, disadvantages and applications. (2 + 8 + 6)

15. (a) (i) Distinguish between primitive cell and unit cell. Describe the diamond structure. What type of bond is present in diamond? (2 + 8 + 2)
- (ii) Iron has BCC structure with atomic radius 0.123 \AA . Find the lattice constant of the unit cell. (4)

Or

- (b) What are the point and line imperfections in solid materials? Illustrate these imperfections with suitable sketches. (16)