Reg. No. :

J 3473

B.E./B.Tech. DEGREE EXAMINATION, MAY/JUNE 2009.

First Semester

Civil Engineering

PH 1101 — PHYSICS — I

(Common to all branches of B.E./B.Tech. except Marine Engineering)

(Regulation 2004)

Time : Three hours   Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1.   Define phon. How is it different from decibel?

2.   What is acoustic grating? How is it used to determine the velocity of ultrasonic waves?

3.   In a BCC lattice, find the ratio of the nearest neighbor's to the next neighbor's distance.

4.   In a crystal whose primitives are 1.2 A°, 1.8 A° and 2 A°, a plane cuts an intercept of 1.2 A° along the x-axis. Find the lengths along the Y and Z axis.

5.   What are isoclinic fringes?

6.   What is an interference filter?

7.   Explain the physical significance of a wave function.

8.   How did classical physics fail to account for the spectral distribution of energy density in a black body?

9.   What is population inversion in a semiconductor laser? How is it achieved?

10. Distinguish between step index and graded index fibers.

PART B — (5 × 16 = 80 marks)

11. (a) (i) Derive Sabine's formula for reverberation time. (12)

    (ii) What is the effect of reverberation time on the acoustics of a building? (4)

Or

    (b) (i) Explain the construction and working of a magnetostrictive transducer. (8)

    (ii) Write short notes on the application of ultrasonic in sound navigation and ranging and medical field. (8)

12. (a) (i) Determine the coordination number and packing factor of FCC and HCP crystal system. (10)

    (ii) Chromium has BCC structure and its atomic radius is 1.249A°. Calculate the free volume per unit cell and the radius of the sphere that will just fit into the largest void at the position (1/2,1/4, 0). (6)

Or

    (b) Write short notes on (i) Ultrasonic flaw detector and (ii) X-ray radiography. (16)

13. (a) (i) Describe and experiment to determine the thickness of a thin fiber. (8)

    (ii) Discuss the construction, working and application of quarter and half wave plates with relevant expressions. (8)

Or

    (b) (i) Explain how stress in a material is distributed by using stress optic law. (8)

    (ii) Write a note on the arrangements of optical elements in plane and circular polariscope. (8)

14. (a) (i) What is photoelectric effect? Which aspects of it were left unexplained by classical mechanics? (6)

    (ii) What is Compton effect? Explain its significance. How was particle nature of radiation confirmed by Compton effect? (10)

Or

(b) **(i)** Derive time dependent Schrodinger's wave equation. Is it relativistically invariant? Explain. (12)

(ii) Evaluate the ratio of de Broglie wavelength of electron to that of proton when (1) both have the same kinetic energy (2) the electron kinetic energy is 1000 eV and that of proton is 100 eV. (4)

15. **(a)** Explain the construction and working of CO_2 and Nd-YAG laser. (16)

Or

(b) **(i)** Explain the fiber optic communication system with the help of a neat sketch and list out its advantages. (12)

(ii) A step index fiber has numerical aperture of 0.16, a core refractive index of 1.45 and a core diameter of 90 micrometer. Calculate the critical angle and the angle of acceptance. (4)

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