Reg. No. : ⎕⎕⎕⎕⎕⎕⎕⎕⎕⎕⎕⎕⎕

Question Paper Code : 31682

B.E./B.Tech. DEGREE EXAMINATION, JANUARY 2014.

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 cavitation?

2. A nickel rod is used to produce ultrasonic waves of frequency f. If ultrasonic Waves with frequency $2f$ is to be produced what should be the length of the nickel rod?

3. What is the function of helium atoms in He-Ne laser?

4. Give any two differences between homo-junction and hetero-junction lasers.

5. For a step index optical fiber with a core of refractive index 1.48 and numerical aperture 0.649, calculate the refractive index of cladding.

6. What is the principle by which temperature is measured using a fiber optical sensor?

7. State Wien's displacement law.

8. An electron is constrained to a one dimensional potential box of 0.1 nm width. Obtain the first eigen value of the electron in electron volts $\left(h = 6.62 \times 10^{-34} \, \text{Js} \right)$.

9. Give the co-ordination number of BCC and FCC structures.

10. What are Schottky defects?

PART B — (5 × 16 = 80 marks)

11. (a) (i) What is inverse piezo-electric effect? Describe the method of producing ultrasonic waves by piezo-electric method. (10)

(ii) Describe about any two methods using which ultrasonic waves can be detected. (6)

Or

(b) (i) Give an account on the application of ultrasonics in

(1) Drilling (3)

(2) Welding and (4)

(3) Cleaning. (3)

(ii) Explain the process of non destructive testing of materials using ultrasonic waves. (6)

12. (a) (i) Describe the construction of Nd-YAG laser and using an energy level diagram explain the working of Nd-YAG laser. (10)

(ii) Discuss about the different pumping schemes used to achieve population inversion in lasers. (6)

Or

(b) (i) Describe the method of construction and reconstruction of images using holography. (10)

(ii) Outline the use of lasers in welding and cutting of materials. (6)

13. (a) (i) Explain the principle and propagation of light through an optical fiber and obtain an expression for numerical aperture and acceptance angle. (10)

(ii) Explain the working of fiber endoscope. (6)

Or

(b) (i) With the help of a block diagram explain the working of an optical communication system. What are its advantages over conventional wire systems? (10)

(ii) Give an account on dispersion and bending losses in optical fibers. (6)

14. (a) (i) What is Compton effect? Obtain an expression for Compton shift. (10)

(ii) Describe briefly about the working of scanning electron microscope. (6)

Or

(b) (i) Write Schrödinger's equation for a particle in a box. Solve it to obtain eigen values and eigen functions and show that they are discrete. (10)

(ii) Obtain Rayleigh Jeans law from Planck s theory. Is Rayleigh Jeans law valid for all wavelengths? (6)

15. (a) (i) Explain the hexagonal closed packed structure and obtain its atomic packing factor. (10)

(ii) Sodium chloride crystallizes in FCC structure. The density of sodium chloride is 2.18×10^3 Kg/m^3. Calculate the distance between two adjacent atoms. The atomic weight of sodium and chlorine are 23 and 35.5 respectively. (6)

Or

(b) (i) What is line defect? Explain edge dislocation using a neat diagram. What are positive and negative edge dislocations? (10)

(ii) Describe the method of determining Miller indices of a given plane in a cubic lattice. (6)