Reg. No. : | | | | | | | | | | | | |

Question Paper Code : 77274

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

First Semester

Civil Engineering

PH 6151 — ENGINEERING PHYSICS — I

(Common to all Branches)

(Regulation 2013)

Time : Three hours | Maximum : 100 marks

Planck's constant	$= 6.62 \times 10^{-34}$ J s
Speed of light	$= 3 \times 10^{8}$ m s^{-1}
Electron rest mass	$= 9.11 \times 10^{-31}$ kg
Proton rest mass	$= 1.67 \times 10^{-27}$ kg

Answer ALL questions.

PART A — ($10 \times 2 = 20$ marks)

1. Calculate the d-spacing of (321) planes of a simple cubic cell of lattice constant 0.41 nm.

2. What is the coordination number of diamond unit cell?

3. How does change in temperature affect the elastic property of a material?

4. State Newton's law of cooling.

5. What is Compton effect?

6. Given that the wavefunction of a particle in a one dimensional box is given by $\psi = \sqrt{(2k)}e^{-kx}$, evaluate the probability of finding the particle in the region $\frac{2}{k} < x < \frac{3}{k}$.

7. A source of sound produces an intensity level of 1 dB at a given point. Calculate the intensity of sound.

8. What is the principle of A-scan display in ultrasonics?

9. What is the purpose of using helium in CO_2 laser?

10. Draw the block diagram of a fibre optical communication system.

PART B — (5 × 16 = 80 marks)

11. (a) (i) Derive an expression for packing fraction of a BCC unit cell. (8)

(ii) Explain the Bridgman technique of growing crystal from melt. (8)

Or

(b) (i) Obtain an expression for d-spacing of (hkl) planes of a simple cubic lattice. (6)

(ii) Derive an expression for packing fraction of a hexagonally close packed structure. (10)

12. (a) (i) A cantilever is clamped horizontally at one end and loaded at the other. Obtain the relation between the depression at the loaded end and the load applied. (12)

(ii) Explain I-shaped girders. (4)

Or

(b) (i) Discuss the radial flow of heat and hence derive an expression for the quantity of heat conducted through any section in unit time. Describe the experiment to determine the thermal conductivity of Rubber. (12)

(ii) Two metal bars A and B are of 50 cm and 70 cm long respectively and have thermal conductivities 385 $Wm^{-1}k^{-1}$ and 296 $Wm^{-1}k^{-1}$ respectively. They are joined together by welding. The outer end of A is at 363 K and the cuter end of B is at 303 K. Calculate the temperature at the welded joint assuming that their cross sections are equal. (4)

13. (a) (i) What are matter waves? Describe the properties of matter waves. Explain in detail G.P. Thomson's gold foil experiment that proved the existence of matter waves. (6 + 6)

(ii) Calculate the de-Broglie wavelength of a proton and an electron, accelerated by a potential of 150 V. (4)

Or

(b) (i) Derive an expression for the energy of a particle in a one dimensional box. Also arrive at an expression for its normalized wavefunction (12)

(ii) A particle of mass one microgram takes 100 s to travel from one end to the other end of an one dimensional box of width 1 mm. Assume that the potential inside and at the walls of the box to be zero and infinity respectively. Determine the quantum number described by this motion. (4)

14. (a) Derive the expressions for rate of growth and rate of decay of average energy of sound in a hall. Hence derive an expression for reverberation time of the hall assuming that the average energy absorbed by all surfaces in one second to be equal to $\frac{EvA}{4}$ where E, v and A represent average energy density, speed of sound and total absorption by all surfaces respectively. (16)

Or

(b) (i) With a neat circuit diagram, explain the principle, working and production of ultrasonics by a piezo electric oscillator (12)

(ii) Explain briefly the through transmission method of non-destructively testing a specimen using ultrasonics. (4)

15. (a) Describe with necessary energy level diagram, the construction and working of Nd-YAG laser. Mention any two applications of Nd-VAG laser. (12 + 4)

Or

(b) (i) Derive expressions for numerical aperture and acceptance angle of an optical fibre. (12)

(ii) Discuss the classification of optical fibre based on the materials. (4)