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

Question Paper Code : 80839

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2016.

First Semester

Civil Engineering

PH 6151 — ENGINEERING PHYSICS – I

(Common to all branches)

(Regulations 2013)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. An element has FCC structure with atomic radius 0.144 nm. Find its lattice constant.

2. Define atomic packing factor.

3. How will you identify a brittle material from the stress-strain diagram?

4. Define thermal conductivity.

5. An electron is confined to a one-dimensional box. How does the energy level spacing changes when the box is made longer?

6. Give any four differences between scanning electron microscope and transmission electron microscope.

7. An auditorium has a plastered walls with sound absorption co-efficient of 0.10 O.W.U. The speech inside the auditorium is not clear due to too much of reverberation. It has been proposed to improve the acoustics of the hall. Two different materials with sound absorption co-efficient of 0.050 O.W.U. and 0.150 O.W.U. are available. Which material you will choose. Give reason.

8. Mention the techniques applied to determine the defects within a material through NDT.

9. Give some differences between the beam of light from a flash lamp and a laser.

10. A step index optical fibre has a core refractive index of 1.5 and cladding refractive index of 1.48. Calculate the critical angle at the core-cladding interface.

PART B — (5 × 16 = 80 marks)

11. (a) (i) Deduce the relation between the interplanar distance '*d*' and the Miller indices (*h k l*) of the planes for a cubic system. (10)

(ii) Calculate the interplanar spacing for (110) and (111) planes in a simple cubic lattice whose lattice constant is 0.424 nm. Also sketch these planes. (6)

Or

(b) (i) Describe any one method of growing single crystal from melt along with the advantages and limitations of the method. (8)

(ii) Describe diamond and graphite structures. (8)

12. (a) (i) Derive an expression for internal bending moment of a beam. (8)

(ii) Derive an expression for the elevation produced at the centre of a simply supported beam loaded at both the ends. (8)

Or

(b) (i) Describe Lee's disc method to determine the thermal conductivity of bad conductors. (12)

(ii) A wall consists of layer of wood and a layer of cork insulation of same thickness. The temperature inside is 20°C and the temperature outside is 0°C. Calculate the temperature at the interface between wood and cork, if the cork is inside and the wood is outside also find the temperature at the interface if the wood is inside and the cork is outside. (Thermal conductivity of wood and cork are 0.13 W/m-K and 0.046 W/m-K respectively). (4)

13. (a) (i) Explain the radiation spectrum of a black body and derive Planck's radiation law. (12)

(ii) An X-ray photon of wavelength 0.010 *nm* is scattered through 110° by an electron. What is the kinetic energy of the recoiling electron? (4)

Or

(b) (i) Solve Schrodinger wave equation for a particle in a one-dimensional box. Sketch the wave function and probability distribution function of the particle when it is in the ground state and first two excited states. (12)

(ii) Find the de Broglie wavelength of an electron accelerated through a potential difference of 80 kV. Find the wavelength of a X-ray photon that possess an energy same as that of the electron. (4)

14. (a) Derive an expression for growth and decay of sound energy inside a hall and represent them graphically. Find an expression for Reverberation time. (16)

Or

(b) (i) Describe the construction and working principle of piezo-electric oscillator of producing ultrasonic waves. (10)

(ii) Briefly explain the principle of sonogram. (6)

15. (a) Explain Einstein's theory of stimulated emission and derive an expression for the ratio between spontaneous emission and stimulated emission. (16)

Or

(b) Explain the principle of propagation of light through an optical fibre and derive an expression for acceptance angle and numerical aperture. (16)
