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<b>Question Paper Code : 71057</b>
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B.E./B.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2021.

First Semester

Civil Engineering

PH 6151 – ENGINEERING PHYSICS – I

(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. List any four factors affecting the elasticity of a material.
4. Define Newton's Law of cooling.
5. What is Compton effect?
6. Given that the wave function 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. Define reverberation time.
8. What is SONAR?
9. Can a two level system be used for the production of laser? Why?
10. Write any four major advantages of optical fibre communication over other communication systems.

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) Derive an expression for the elevation at the centre of a beam which is loaded at both ends. Describe an experiment, to determine the Young's modulus of a beam loaded at both ends in detail.

Or

- (b) Describe with relevant theory the method of determining the co-efficient of thermal conductivity of a bad conductor by Lee's disc method.
13. (a) (i) Derive Planck's law of radiation. (12)
- (ii) In a Compton scattering experiment the incident photons have a wavelength of  $3\text{\AA}$ . What is the wavelength of the scattered photons if they are viewed at an angle of  $60^\circ$  to the direction of incidence? (4)

Given :

$$M_e = 9.1 \times 10^{-31} \text{ Kg}$$

$$h = 6.625 \times 10^{-34} \text{ Js}$$

$$C = 3 \times 10^8 \text{ ms}^{-1}$$

Or

- (b) Write the principle, working, advantages and disadvantages of scanning electron microscope. (16)

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) Explain in detail how optical fibers are characterized according to the material, refractive index and modes of propagation. (16)

Or

- (b) Explain the construction and working of Nd : YAG laser with its advantages. (16)

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