



(The figures in the right hand margin indicate marks.)

PART - A

(2 x 5 = 10 Marks)

Q.1. Answer **ALL** questions

- | | CO # | Blooms Level |
|--|------|--------------|
| a. Two waves of amplitudes 5cm, 10 cm and same frequency superimpose coherently and incoherently to produce a resultant wave. Find the ratio of the resultant intensities. | CO1 | K3 |
| b. Why magnetic monopole does not exist? | CO2 | K 1 |
| c. Define piezoelectric and pyroelectric materials. | CO3 | K 1 |
| d. Why X-ray is used for Bragg's experiment? | CO4 | K 1 |
| e. Electrons are not the part of a nucleus. Prove it. | CO6 | K 2 |

PART - B

(10 x 5 = 50 Marks)

Answer **ALL** the questions

- | | Marks | CO # | Blooms Level |
|--|-------|------|--------------|
| 2. a. Discuss with a neat diagram that how interference fringes are produced in Newton's Ring experiment. Derive the diameters of dark and bright ring from Newton's ring experiment with necessary diagram? | 8 | CO1 | K 1 |
| b. In a Newton's Ring experiment, the diameters of 9 th and 16 th dark ring are 0.6cm and 1.5cm respectively. If the radius of curvature of the Plano convex lens is 100cm, then find the wavelength of the light? | 2 | CO1 | K 2 |
| (OR) | | | |
| c. What is Damped harmonic oscillator? Derive the solution for the under damped oscillation. | 6 | CO1 | K 1 |
| d. What is quality factor? Find the velocity of longitudinal wave in a medium of density $\rho = 9.8 \times 10^3 \text{ Kg/m}^3$ and bulk modulus $B = 12 \times 10^{11} \text{ N/m}^2$ | 4 | CO1 | K 1 |
| 3.a. What is Poynting vector? State and explain Poynting theorem. | 7 | CO2 | K 2 |
| b. (i) Evaluate curl of the vector field, $B = 2i \hat{x}y + 4j \hat{y}z + 5k \hat{z}x$ (ii) Calculate the gradient of the scalar field, $\phi = x^3y + yz + x^2z^2$. | 3 | CO2 | K 1 |
| (OR) | | | |
| c. Derive the electromagnetic wave equations for electric field and magnetic field in charge free conducting medium. | 6 | CO2 | K 1 |

| | | | | |
|------|--|---|-----|----|
| d. | Differentiate between conduction current and displacement current? A point source emits light with power 250 W. Find the average value of the Poynting vector at a distance of 2m from the source. | 4 | CO2 | K1 |
| 4.a. | What are the methods to determine the Miller indices of a crystal plane? Find the Miller indices of a crystal plane having the intercepts 2a, 2b and 4c, where a, b and c are the crystal parameters. | 6 | CO3 | K1 |
| b. | What is a dielectric material? X-ray of wavelength 2.4 \AA is used to produce 2^{nd} order diffraction for glancing angle 45° , find the inter-planar spacing between the crystal planes. | 4 | CO3 | K2 |
| (OR) | | | | |
| c. | What is reciprocal lattice? Derive an expression of a BCC lattice. | 7 | CO3 | K1 |
| d. | Define Crystal defect. | 3 | CO3 | K1 |
| 5a. | What is isotope effect? The critical temperature for mercury with an isotopic mass of 169.5u is 4.115K. Calculate its critical temperature when its isotopic mass changes to 179.4u. Compare between Type-I and Type-II superconductors. | 6 | CO4 | K2 |
| b. | Write different parts of optical fibre. In an optical fibre, the core material has refractive index 1.8 and refractive index of the cladding material is 1.5. | 4 | CO5 | K1 |
| (OR) | | | | |
| c. | Differentiate between Dia, Para, and ferro-magnetic material with examples? | 4 | CO4 | K1 |
| d. | Sketch the block diagram of Fibre Optics Communication Link and explain its Operation. A fibre has core and cladding index 1.68 & 1.5 respectively. Find the acceptance angle of the fibre. | 6 | CO5 | K3 |
| 6.a. | State Heisenberg's Uncertainty principle. Using it prove the non-existence of electron in a Nucleus. | 6 | C6 | K1 |
| b. | What is photoelectric effect? In a photoelectric experiment, the threshold wavelength of tungsten cathode is 5600 \AA . Calculate the work function of the metal if it is irradiated by a light of wavelength 4800 \AA . | 4 | CO6 | K3 |
| (OR) | | | | |
| c. | Explain Compton Scattering with suitable diagram? Discuss its different cases. Find the De Broglie's wavelength for an electron whose kinetic energy is 0.05eV. | 5 | CO6 | K2 |
| d. | Using Schrodinger's equation, discuss the case of a one dimensional potential Step. Mention its reflection and transmission coefficients. | 5 | CO6 | K2 |

--- End of Paper ---