PHYSICS QUESTION PAPER

Time : 2 Hrs. **Max. Marks : 40**

Q. 1 Select and write the most appropriate answer from the given alternatives for each sub question.

(i) In the purely resistive A.C. circuit ..... (1)

(a) current leads e.m.f. by a phase angle of π radians.

(b) current leads e.m.f. by a phase angle of $\frac{\pi}{2}$ radians.

(c) current and e.m.f. are in phase.

(d) current lags behind e.m.f. by a phase angle of $\frac{\pi}{2}$ radians.

(ii) In the biprism experiment keeping the experimental set up unchanged, the fringe width ..... (1)

(a) increases with increase in wavelength.
(b) decreases with increase in wavelength
(c) increases with decrease in wavelength
(d) remains unchanged with change in wavelength.

(iii) Condenser is a device used to store ..... (1)

(a) large charge at low potential. (b) less charge at low potential
(c) large charge at high potential (d) less charge at high potential.

(iv) S. I. unit of potential gradient is ..... (1)

(a) V cm (b) (c) Vm (d) V/m

(v) In order to convert a moving coil galvanometer into a voltmeter ..... (1)

(a) a high resistance is connected in parallel with the galvanometer
(b) a high resistance is connected in series with the galvanometer
(c) a low resistance is connected in parallel with the galvanometer
(d) a low resistance is connected in series with the galvanometer.

(vi) In a semiconductor, acceptor impurity is ..... (1)

(a) antimony (b) indium (c) phosphorous (d) arsenic.

(vii) If the polarizing angle for a given medium is 60°, then the refractive index of the medium is (1)

(a) $\frac{1}{\sqrt{3}}$ (b) 1 (c) $\frac{\sqrt{3}}{2}$ (d) $\sqrt{3}$

(viii) Magnetic potential at a point due to a short magnetic dipole of moment 2 Am^2 at a distance of 100 cm along a line making an angle of 60° with the axis is .....
($\mu_o = 4\pi \times 10^{-7}$ Wb/Am) (1)

(a) $\sqrt{3} \times 10^{-7}$ J/Am (b) 1×10^{-7} J/Am
(c) $\sqrt{3} \times 10^{-11}$ J/Am (d) 1×10^{-9} J/Am

Q. 2 (A) Attempt any One :

(i) A current of 0.2 A passed through a tangent galvanometer produces a deflection of 30°. Find a current which will produce a deflection of 60°. (2)

(ii) Energy stored in a charged capacitor of 25 p F is 4 J. Find the charge on its plate. (2)

(B) Attempt any Two :

(i) Explain the resolving power of a telescope with the help of a neat ray diagram. On what factors does it depend ? (3)

(ii) Explain ferromagnetism on the basis of domain theory. (3)

(iii) Obtain the balancing condition of Wheatstone's network. (3)

Q. 3 (A) Attempt any One

(i) State any four advantages of optical communication over conventional communication system. (2)

(ii) Draw a neat labelled circuit diagram to determine resistance of a galvanometer using Kelvin's method. (2)

(B) Attempt any Two :

(i) Using analytical method, obtain an expression for path difference between two interfering light waves. Hence show that bright and dark bands are produced alternately in the interference pattern. (3)

(ii) Derive an expression for the mechanical force per unit area of charged conductor. (3)

(iii) State the principle of a moving coil galvanometer and explain its working . (3)

Q.4 (A) Attempt any Two :

(i) Write a short note on space wave propagation. (2)

(ii) State Faraday's laws of electromagnetic induction. (2)

(iii) Derive an expression for de Broglie wavelength of an electron moving under potential difference of V volt. (2)

(B) Attempt any One :

(i) What is a rectifier ? With a neat circuit diagram, explain working of P-N Junction diode as a full wave rectifier. (4)

(ii) State Huygen's principle. Explain refraction of a plane wavefront at a plane surface on the basis of Huygen's wave theory of light. (4)

Q.5 Attempt any Two :

(i) An alternating e.m.f. of peak value 110 V and frequency 50 Hz is connected across LCR series circuit with R = 100 Ω, L = 10 mH and C = 25 μF.
Calculate inductive reactance, capacitive reactance and impedance of the circuit.

(ii) The trehashold wavelength for silver is 3800 A.U. Calculate maximum kinetic energy in e V of photoelectrons emitted, when ultraviolet light of wavelength 2600 A.U. falls on it. Also calculate stopping potential.
(1 e V = 1.6×10^{-19} J; Planck's constant = 6.63×10^{-34} JS;
Speed of light in vacuum = 3×10^{8} m/s).

(iii) Second member of Balmer series of hydrogen atom has wavelength 4860 A.U. Calculate Rydberg's constant. Hence, calculate energy in e V when electron is orbiting third Bohr orbit.
(Plank's constant = 6.63×10^{-34} JS; Speed of light in vacuum = 3×10^{8} m/s; 1 eV = 1.6×10^{-19} J