

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. [8]

- (i) Kirchhoff's first law is the consequence of Law of Conservation of (1)
(a) mass (b) energy
(c) charge (d) momentum
- (ii) The tangent galvanometer is set into magnetic meridian (1)
(a) to minimize error due to parallax.
(b) to produce strong magnetic field.
(c) to make magnetic field due to current carrying coil, exactly parallel to horizontal component of earth's magnetic field.
(d) to make magnetic field due to current carrying coil, exactly perpendicular to horizontal component of earth's magnetic field.
- (iii) In L.C.R. series circuit, at resonance, the power factor is (1)
(a) zero (b) 0.5
(c) 1 (d) ∞
- (iv) Which of the following quantities has same units and dimensions as that of Planck's constant ? (1)
(a) Moment of inertia (b) Angular momentum
(c) Linear momentum (d) Rate of change of linear momentum
- (v) Avalanche breakdown in a Zener diode takes place due to (1)
(a) thermal energy (b) light energy
(c) magnetic field (d) accelerated minority charge carriers
- (vi) Global communication is achieved by using (1)
(a) single geostationary satellite
(b) minimum two geostationary satellites 180° apart.
(c) minimum three geostationary satellites 120° apart.
(d) minimum four geostationary satellites 90° apart.
- (vii) The refractive indices of glass and diamond with respect to air are 1.5 and 2.4 respectively. The refractive index of diamond with respect to glass is (1)
(a) 0.62 (b) 0.9
(c) 1.95 (d) 1.6
- (viii) Two condensers each of capacity $4\ \mu\text{F}$ are connected in series and third condenser of capacity $4\ \mu\text{F}$ is connected in parallel with the combination. Then the equivalent capacitance of the arrangement is (1)
(a) $12\ \mu\text{F}$ (b) $8\ \mu\text{F}$
(c) $6\ \mu\text{F}$ (d) $2.65\ \mu\text{F}$

Q.2 (A) Attempt any One : [8]

- (i) A potentiometer wire has a resistance per unit length $0.1\ \Omega/\text{m}$. A cell of e.m.f. $1.5\ \text{V}$ balances against $300\ \text{cm}$ length of the wire. Find the current through the potentiometer wire. (2)
- (ii) The velocity of electron in the first Bohr orbit of radius $0.5\ \text{A.U.}$ is $2.24 \times 10^6\ \text{m/s}$. Calculate the period of revolution of the electron in the same orbit. (2)

(B) Attempt any Two :

- (i) State and prove Gauss's theorem in electrostatics (3)
- (ii) In biprism experiment show that, $d = \sqrt{d_1 d_2}$, using the conjugate foci method. Draw the necessary ray diagrams. (3)
- (iii) State Ampere's law and hence obtain an expression for the magnetic induction at any point near a straight conductor carrying a current. (3)

Q. 3 (A) Attempt any One : [8]

- (i) Draw a neat labelled circuit diagram for NPN transistor as an amplifier in a common emitter mode. (2)
- (ii) Give the construction of a suspended coil type of moving coil galvanometer. (2)

(B) Attempt any Two :

- (i) Explain in brief, types of wave propagation in space communication. (3)
- (ii) Describe meter bridge experiment to determine resistance of galvanometer by Kelvin's method. (3)
- (iii) State de-Broglie's hypothesis of matter waves and derive an expression for de-Broglie wavelength. (3)

Q.4 (A) Attempt any Two : [8]

- (i) Distinguish between step-up and step-down transformer. (2)
- (ii) Describe the construction of van-de-Graaff generator. (2)
- (iii) State the principle and uses of solar cell. (2)

(B) Attempt any One :

- (i) Explain the construction and working of Nicol prism. (4)
- (ii) Derive an expression for magnetic induction at any point due to a short magnetic dipole. (4)

Q.5 Attempt any Two : [8]

- (i) In a double slit experiment, the optical path difference between the rays from two coherent sources at a point P on one side of the central bright band is 7.5×10^{-6} m and at a point Q on the other side of the central bright band is 1.8×10^{-6} m. How many bright and dark bands are observed between the points P and Q if wavelength of light used is 6×10^{-7} m ? (4)
- (ii) An A.C. supply of frequency 50 Hz is supplied to a series combination of $25 \mu\text{F}$ condenser, 0.1 Henry inductor and 24Ω resistor. Calculate inductive and capacitive reactance. Also find impedance of the circuit. (4)
- (iii) In an experiment for measuring $\frac{e}{m}$ ratio, a cathode particle is passing through two deflecting plates maintained at a voltage difference of 40 V and separated by a distance of 2 cm. The cathode particle travelling at right angles to the field moves in a circular path of radius 2 m. Determine the kinetic energy of the electron in eV. (4)