

SECTION – I**2. Write short answers to any EIGHT (8) questions :****16**

- (i) Is E necessarily zero inside a charged rubber balloon if balloon is spherical? Assume that charge is distributed uniformly over the surface.
- (ii) Do electrons tend to go to region of high potential or of low potential?
- (iii) How a sensitive electric apparatus is shielded from electric fields?
- (iv) Give a comparison of electric and gravitational forces.
- (v) Describe the right hand rule to find the direction of magnetic field inside a current carrying solenoid.
- (vi) Electric force does work, while no work is done by the magnetic force. Why?
- (vii) A plane conducting loop is located in a uniform magnetic field that is directed along the x-axis. For what orientation of the loop is the flux a maximum? For what orientation is the flux a minimum?
- (viii) How can a current loop be used to determine the presence of a magnetic field in a given region of space?
- (ix) How an emf is induced in a coil of wire using a bar magnet?
- (x) Why the self induced emf is sometimes called as back emf ?
- (xi) Does the induced emf always act to decrease the magnetic flux through a circuit?
- (xii) Show that ε and $\frac{\Delta\phi}{\Delta t}$ have the same units.

3. Write short answers to any EIGHT (8) questions :**16**

- (i) Does bends in a wire affect its electrical resistance? Explain.
- (ii) Why does the resistance of a conductor rise with temperature?
- (iii) What is temperature co-efficient of resistance?
- (iv) A sinusoidal current has rms value of 10A. What is the maximum or peak value?
- (v) How many times per second will an incandescent lamp reach maximum brilliance when connected to a 50 Hz source?
- (vi) What are the electromagnetic waves?
- (vii) Write a note on superconductors.
- (viii) What is meant by hysteresis loss? How is it used in the construction of a transformer?
- (ix) Differentiate between N-type and P-type substances.
- (x) Why ordinary silicon diodes do not emit light?
- (xi) Why a photodiode is operated in reverse biased state?
- (xii) What is the working principle of a light emitting diode?

4. Write short answers to any SIX (6) questions :**12**

- (i) If an electron and proton have the same de Broglie wavelength, which particle has greater speed?
- (ii) Which photon red, green or blue carries the most energy and momentum?

4. (iii) What are black body radiations?
- (iv) What do we mean when we say that the atom is excited?
- (v) Is energy conserved when an atom emits a photon of light?
- (vi) Describe a brief account of interaction of various types of radiations with matter.
- (vii) Why are heavy nuclei unstable?
- (viii) What do we mean by term critical mass?
- (ix) Differentiate between Baryons and Mesons.

SECTION – II

Note : Attempt any **THREE** questions.

5. (a) Define capacitance. Derive an expression for the capacitance of a parallel plate capacitor when dielectric is inserted between the plates. 5
- (b) A rectangular bar of iron is 2 cm by 2 cm in cross-sectional area and 40 cm long. Calculate its resistance if the resistivity is $11 \times 10^{-8} \Omega m$. 3
6. (a) Discuss the principle, construction and working of alternating current generator. Also find expression for induced emf and current. 5
- (b) Find the radius of an orbit of an electron moving at a rate of $2.0 \times 10^7 ms^{-1}$ in a uniform magnetic field of $2.0 \times 10^{-3} T$. 3
7. (a) What is the behaviour of A.C. current and voltage in inductor? Discuss power loss through an inductor over a period. 5
- (b) The current flowing into the base of a transistor is $100 \mu A$. Find its collector current I_C , its emitter current I_E and the ratio $\frac{I_C}{I_E}$. If the value of current gain β is 100. 3
8. (a) Describe the principle, construction and working of a Wilson Cloud Chamber. 5
- (b) What stress should cause a wire to increase in length by 0.01%, if the Young's modulus of the wire is $12 \times 10^{10} Pa$? What force would produce this stress if the diameter of the wire is 0.56 mm? 3
9. (a) What is wave nature of particles? How Davisson and Germer experiment confirmed it? 5
- (b) Find the speed of the electron in the first Bohr orbit. 3