

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

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- (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 :

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- (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 :

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- (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 $12 \times 10^{10} P.a$? 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