

SECTION – I

2. Write short answers to any EIGHT (8) questions :

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- (i) What is electric intensity? What is its SI unit?
- (ii) Show that $\frac{1 \text{ volt}}{1 \text{ meter}} = \frac{1 \text{ Newton}}{1 \text{ Coulomb}}$
- (iii) Describe the force or forces on a positive point charge when placed between parallel plates with similar and equal charges.
- (iv) Do electrons tend to go to region of high potential or of low potential?
- (v) Describe the change in the magnetic field inside a solenoid carrying a steady current I , if the length of the solenoid is doubled but the number of turns remains the same.
- (vi) What is CRO? What is the function of grid in CRO?
- (vii) Define ammeter. How can we increase the range of an ammeter?
- (viii) Suppose that a charge q is moving in a uniform magnetic field with a velocity V . Why is there no work done by the magnetic force that acts on the charge q ?
- (ix) State Faraday's law of electromagnetic induction and also write expression for it.
- (x) Define mutual inductance of the coils and also define its unit henry.
- (xi) Does the induced emf in a circuit depend on the resistance of the circuit? Does the induced current depend on the resistance of the circuit?
- (xii) In a transformer, there is no transfer of charge from the primary to secondary. How is, then the power transferred?

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

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- (i) Define temperature coefficient of resistance and write its formula.
- (ii) A potential difference is applied across the ends of a copper wire. What is the effect on the drift velocity of free electrons by decreasing the length and the temperature of the wire?
- (iii) Is the filament resistance lower or higher in a 500 w, 220 v light bulb than in a 100 w, 220 v?
- (iv) What is impedance? Write its formula.
- (v) A sinusoidal current has rms value of 10A. What is the maximum or peak value?
- (vi) What is meant by A.M. and F.M.?
- (vii) Differentiate between ductile and brittle substances.
- (viii) Define stress and strain. What are their SI units?
- (ix) What is meant by hysteresis loss?
- (x) What is depletion region?
- (xi) How does the motion of an electron in a n-type substance differ from the motion of holes in a p-type substance?
- (xii) What is the principle of virtual ground?

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

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- (i) Define Compton effect. At what angle Compton shift becomes equal to the Compton wave length?
- (ii) As a solid is heated and begins to glow, why does it first appear red?
- (iii) What happens to radiation energy from a blackbody if its temperature is doubled?

(Turn Over)

4. (iv) Define excitation energy and ionization energy.
- (v) How can spectrum of hydrogen contain so many lines when hydrogen contains one electron? Explain.
- (vi) Can X-rays be reflected, refracted and polarized just like any other waves? Explain.
- (vii) Write down two advantages of solid state detector.
- (viii) Why are heavy nuclei unstable?
- (ix) A particle which produces more ionization is less penetrating. Why?

SECTION – II

Note : Attempt any **THREE** questions.

5. (a) What is Gauss's law? Applying Gauss's law find the electric intensity between two oppositely charged parallel plates. 5
- (b) A rectangular bar of iron is 2.0 cm by 2.0 cm in cross-section and 40 cm long. Calculate the resistance if the resistivity of iron is $11 \times 10^{-8} \Omega m$. 3
6. (a) Derive an expression for torque acting on current carrying coil placed in uniform magnetic field. 5
- (b) A circular coil has 15 turns of radius 2 cm each. The plane of the coil lies at 40° to a uniform magnetic field of 0.2 T. If the field is increased by 0.5 T in 0.2 s, find the magnitude of induced emf? 3
7. (a) Define comparator. Describe how it is used as a night switch. 1,1,3
- (b) A circuit has an inductance of $\frac{1}{\pi} H$ and resistance of 2000Ω . A 50 Hz A.C is supplied to it. Calculate the reactance and impedance offered by the circuit. 3
8. (a) Describe the formation of energy bands in solids. Explain the difference amongst electrical behaviour of conductors, insulators and semiconductors in terms of energy band theory. 5
- (b) An electron is to be confined to a box of the size of the nucleus ($1.0 \times 10^{-14} m$). What would the speed of the electron if it were so confined? 3
9. (a) What are postulates of Bohr's model of the hydrogen atom? Show that energy of hydrogen atom is quantized. 5
- (b) How much energy is absorbed by a man of mass 80 kg who receives a lethal whole body equivalent dose of 400 rem in the form of low energy neutrons for which RBE factor is 10? 3