

Time: 2:40 Hours

SUBJECTIVE

Marks: 68

Note: Section I is compulsory. Attempt any three (3) questions from Section II.

(SECTION – I)

2. Write short answers to any EIGHT questions.

(2 x 8 = 16)

- i. Define electron volt and prove that $1\text{ev} = 1.6 \times 10^{-19}\text{J}$.
- ii. Give a comparison between electric force and gravitational force.
- iii. Upon what factors electric flux does depend?
- iv. Do electrons tend to go to region of high potential or of low potential?
- v. State Ampere's law and write down its formula.
- vi. Define magnetic flux and flux density.
- 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. Why does the picture on a TV screen become distorted, when a magnet is brought near the screen?
- ix. 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.
- x. Does the induced emf always act to decrease the magnetic flux through a circuit?
- xi. Define motional emf and write down its formula.
- xii. Upon what factors self-inductance does depend?

3. Write short answers to any EIGHT questions.

(2 x 8 = 16)

- i. Define the temperature co-efficient of resistance. Write down an expression for temperature co-efficient of resistance in terms of resistivity.
- ii. Do bends in a wire affect the electrical resistance? Explain.
- iii. Explain why the terminal potential difference of a battery decreases when the current drawn from it is increased?
- iv. Define impedance and write down its SI units.
- v. What is the main advantage of three phase A.C supply?
- vi. A circuit contains an iron-cored inductor, a switch and a D.C. source, arranged in series. The switch is Closed and after an interval reopened. Explain why a spark jumps across the switch contacts?
- vii. Draw a stress-strain curve for a metallic wire and mention the points representing proportional limit, elastic limit, UTS or nominal strength and fracture stress.
- viii. Define modulus of elasticity. Also discuss its three kinds.
- ix. What is meant by hysteresis loss? How is it used in the construction of a transformer?
- x. What is photovoltaic cell?
- xi. What does it mean when we say that output of an amplifier is 180° out of phase with its input?
- xii. What is the net charge on an n-type or a p-type substance?

4. Write short answers to any SIX questions.

(2 x 6 = 12)

- i. What advantages an electron microscope has over an optical microscope?
- ii. Write down some important results of photoelectric effect.
- iii. If the following particles have the same energy, which has the shortest wavelength? Electron, alpha Particle, neutron, proton.
- iv. What do we mean when we say that atom is excited?
- v. Explain de-Broglie's interpretation of Bohr's orbits.
- vi. Why are heavy nuclei unstable?
- vii. What factors make a fusion reaction difficult to achieve?
- viii. Write down the name of basic forces of nature.
- ix. Differentiate between mass defect and binding energy.

(Turn Over)

(SECTION - II)

5. (a) State Gauss's law. Find electric field intensity between two oppositely charged parallel plates. 5
(b) A platinum wire has resistance of $10\ \Omega$ at 0°C and $20\ \Omega$ at 273°C . Find the value of temperature co-efficient of resistance of platinum. 3
6. (a) State Faraday's law of electromagnetic induction and also derive the relation for induced emf. 5
(b) A solenoid 15.0 cm long has 300 turns of wire. A current of 5.0 A, flows through it. What is the magnitude of magnetic field inside the solenoid. 3
7. (a) How can we use a transistor as an amplifier? 5
(b) A 10 mH, $20\ \Omega$ coil is connected across 240 V and $\frac{180}{\pi}$ Hz source. How much power does it dissipate? 3
8. (a) Differentiate between insulators, conductors and semi-conductors on the basis of energy band theory. 5
(b) Find the mass defect and binding energy of the deuteron nucleus. The experimental mass of deuteron is 3.3435×10^{-27} kg, and that of proton and neutron 1.6726×10^{-27} kg and 1.6749×10^{-27} kg respectively. 3
9. (a) What is photoelectric effect? What is the effect of frequency of light on photoelectric current? 5
Derive the Einstein's photoelectric equation.
(b) Electrons in an x-ray tube are accelerated through a potential difference of 3000 V. If these 3
Electrons were slowed in a target, what will be the minimum wavelength of x-rays produced?