

OBJECTIVE

MAXIMUM MARKS: 17

Note: You have four choices for each objective type question as A, B, C and D. The choice which you think is correct, fill that bubble in front of that question number, on bubble sheet. Use marker or pen to fill the bubbles. Cutting or filling two or more bubbles will result in zero mark in that question. No credit will be awarded in case BUBBLES are not filled. Do not solve question on this sheet of OBJECTIVE PAPER.

Q.No.1

- (1) $\frac{\text{sec}}{\text{ohm}}$ is equal to:
 (A) Coulomb (B) Farad (C) Joule (D) Ampere
- (2) S.I unit of electric flux is:
 (A) NC^{-1} (B) Nm^2C^{-1} (C) NmC^{-1} (D) NmC^2
- (3) A thermistor is a heat sensitive:
 (A) Resistor (B) Capacitor (C) Inductor (D) Diode
- (4) S.I unit of magnetic flux density is:
 (A) $Wb\ m$ (B) $Wb\ m^{-1}$ (C) $Wb\ m^{-2}$ (D) $Wb\ m^{-3}$
- (5) If 300 turns of wire are wound on 30cm length, then number of turns per unit length is:
 (A) 10 (B) 20 (C) 100 (D) 1000
- (6) The principle of A.C generator is:
 (A) Mutual induction (B) Self induction (C) Electromagnetic induction (D) All of these
- (7) Energy density in inductor is given by:
 (A) $\frac{1}{2} \frac{B}{\mu_0}$ (B) $\frac{1}{2} \frac{B}{\mu_0^2}$ (C) $\frac{1}{2} \frac{B^2}{\mu_0^2}$ (D) $\frac{1}{2} \frac{B^2}{\mu_0}$
- (8) The device which allows only the flow of D.C is:
 (A) Capacitor (B) Resistor (C) Inductor (D) Generator
- (9) In R.L.C series circuit resonance occurs when:
 (A) $X_C > X_L$ (B) $X_L > X_C$ (C) $X_L \gg X_C$ (D) $X_L = X_C$
- (10) The Curie temperature for iron is:
 (A) 923 K (B) 1023 K (C) 823 K (D) 723 K
- (11) For non-inverting amplifier, if $R_1 = \infty\ ohm$, $R_2 = 0\ ohm$ then gain of amplifier is:
 (A) 2 (B) 0 (C) 1 (D) Infinite
- (12) The current gain " β " of a transistor is given by:
 (A) $\frac{I_C}{I_B}$ (B) $\frac{I_E}{I_C}$ (C) $\frac{I_B}{I_C}$ (D) $\frac{I_E}{I_B}$
- (13) The rest mass of X-ray photon is:
 (A) $1.6 \times 10^{-19}\ kg$ (B) $9.1 \times 10^{-31}\ kg$ (C) $1.67 \times 10^{-27}\ kg$ (D) Zero
- (14) When platinum wire is heated, it becomes white at temperature:
 (A) $900^\circ C$ (B) $1100^\circ C$ (C) $1300^\circ C$ (D) $1600^\circ C$
- (15) The value of Rydberg constant is:
 (A) $1.0974 \times 10^7\ m^{-1}$ (B) $1.0974 \times 10^{-7}\ m^{-1}$ (C) $1.0974 \times 10^{11}\ m^{-1}$ (D) $1.0974 \times 10^{-11}\ m^{-1}$
- (16) When γ -rays are emitted, the nuclear mass of an element:
 (A) Increases by 2 units (B) Increases by 1 unit (C) Decreases by 4 units (D) Does not change
- (17) The particles equal in mass or greater than proton are:
 (A) Baryons (B) Hadrons (C) Fermions (D) Mesons

NOTE: Write same question number and its part number on answer book,
 as given in the question paper.

SECTION-I

2. Attempt any eight parts.

$8 \times 2 = 16$

- (i) Electric lines of force never cross. Explain why?
- (ii) If a point charge ' q ' of mass m is released in a non-uniform electric field with field lines pointing in the same direction, will it make a rectilinear motion?
- (iii) Prove that $1 \frac{\text{volt}}{\text{meter}} = 1 \frac{\text{Newton}}{\text{Coulomb}}$
- (iv) A particle carrying a charge of $2e$ falls through a potential difference of $3.0V$. Find energy acquired by it.
- (v) How can you use a magnetic field to separate isotopes of chemical element?
- (vi) If a charged particle moves in a straight line through some region of space, can you say that magnetic field in the region is zero?
- (vii) Draw Saw tooth voltage waveform and explain it.
- (viii) Define magnetic flux and one Tesla.
- (ix) Does the induced emf in a circuit depend on the resistance of the circuit?
- (x) How would you position a flat loop of wire in a changing magnetic field, so that there is no emf induced in the loop?
- (xi) A metal rod of length $25cm$ is moving at speed of $0.5m/s$ in a direction perpendicular to a $0.25T$ magnetic field. Find the emf produced in the rod.
- (xii) Define motional emf and write its mathematical expression.

3. Attempt any eight parts.

$8 \times 2 = 16$

- (i) Do bends in a wire affect its electrical resistance? Explain.
- (ii) Why does the resistance of a conductor rise with temperature?
- (iii) State Kirchhoff's Second Rule and write its equation.
- (iv) In a R-L circuit will the current lag or lead the voltage? Illustrate your answer by a vector diagram.
- (v) How does doubling the frequency affect the reactance of (a) an inductor (b) a capacitor
- (vi) Write four properties of parallel resonance circuit.
- (vii) Distinguish between ductile and brittle substances.
- (viii) Define modulus of elasticity. Show that the units of modulus of elasticity and stress are the same.
- (ix) Write a brief note on superconductor.
- (x) What is rectification, write its two types.
- (xi) Why is the base current in a transistor very small?
- (xii) Why ordinary silicon diodes do not emit light?

4. Attempt any six parts.

$6 \times 2 = 12$

- (i) Discuss the variation of photoelectric current with the intensity of light falling on plate of photocell.
- (ii) Which photon, red, green or blue carries the most (a) energy and (b) momentum.
- (iii) What advantages an electron microscope has over an optical microscope?

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- (iv) What are characteristic X – rays? How are they originated from the atoms?
- (v) Can the electron in the ground state of hydrogen absorb a photon of energy 13.6 eV and greater than 13.6 eV ?
- (vi) Why is the mass of a nucleus less than the total mass of constituent particles? Where is this mass lost?
- (vii) What is the difference between hadrons and leptons?
- (viii) A particle which is more ionizing is less penetrating. Why?
- (ix) What do you understand by “back ground radiation”? State two sources of this radiation.

SECTION-II

NOTE: Attempt any three questions.

$3 \times 8 = 24$

- 5.(a) Derive an expression for the energy stored in the capacitor. 5
- (b) The potential difference between the terminals of a battery in open circuit is 2.2 V . When it is connected across a resistance of 5.0Ω . The potential falls to 1.8 V . Calculate the current and the internal resistance of the battery. 3
- 6.(a) Define self induction. Prove that in case of inductor, the energy density is directly proportional to the square of magnetic field. 5
- (b) A power line 10 m high carries a current 200 A . Find the magnetic field of the wire at the ground. 3
- 7.(a) Describe A.C through R–C series circuit. 5
- (b) In a circuit, the transistor has a current 10 mA at collector and base current $40\mu\text{ A}$. What is the current gain of the transistor? 3
- 8.(a) What are intrinsic and extrinsic semiconductors? How the P – type and N – type materials are formed? 5
- (b) Calculate the energy (in MeV) released in the following fusion reaction: 3

$${}^2_1\text{H} + {}^3_1\text{H} \longrightarrow {}^4_2\text{He} + {}^1_0\text{n}$$
- 9.(a) What is photoelectric effect? Write two results of this effect which cannot be explained by classical electromagnetic theory. Explain them on the basis of quantum theory. 5
- (b) A tungsten target is struck by electron that have been accelerated from rest through 40 kV potential difference. Find the shortest wavelength of the bremsstrahlung radiation emitted. 3