QUARTERLY EXAMINATION - 2023

PHYSICS

CLASS : XII

Register No

M.Poovarasan M.Sc B.Ed

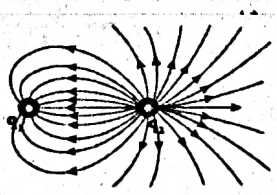
TIME : 3.00 Hr.

MAX. MARKS : 70

Note: (i) Answer all the questions **15x1=15**

(ii) Choose the most appropriate answer from the given four alternatives and write the option code and the corresponding answer

1. A wire connected to a power supply of 230 V has power dissipation P_1. Suppose the wire is cut into two equal pieces and connected parallel to the same power supply. In this case power dissipation is P_2. The ratio $\frac{P_2}{P_1}$ is
   a) 1 b) 2 c) 3 d) 4
2. A proton moving along Z axis with constant velocity. If a magnetic field is applied along x axis, then the direction of magnetic force on proton is
   a) along z - axis b) along y - axis c) along X -axis d) zero force
3. When the current changes from $+2A$ to $-2A$ in $0.05\ s$, an emf of $8\ V$ is induced in a coil. The co-efficient of self-induction of the coil is
   a) 0.2 5 H b) 0.4 H c) 0.8 H d) 0.1 H
4. An object is placed in front of a convex mirror of focal length of f and the maximum and minimum distance of an object from the mirror such that the image formed is real and magnified.
   a) *2f and c* b) *c and* ∞ c) *f and O* d) None of these
5. Two point charges A and B having charges +Q and –Q respectively, are placed at certain distance apart and force acting between them is F. If 25% charge of A is transformed to B, then force between the charges becomes
   a) $\frac{16}{9}F$ b) $\frac{4}{3}F$ c) F d) $\frac{9}{16}F$
6. Three wires of equal lengths are bent in the form of loops. One of the loops is circle, another is a semi-circle and the third one is a square. They are placed in a uniform magnetic field and same electric current is passed through them. Which of the following loop configuration will experience greater torque?
   a) semi-circle b) square c) circle d) all of them
7. The angle of a small sized prism is 4.5° and its refractive index 1.52. The angle of deviation will be
   a) 1.5° b) 2.34° c) 4.5° d) 2°
8. What is the ratio of the charges $\left|\frac{q_2}{q_1}\right|$ or the following electric field line pattern?
   a) $\frac{1}{5}$ b) $\frac{25}{11}$
   c) 5 d) $\frac{11}{25}$



9. Resistance of a carbon resistor determined from colour codes is $(22000 \pm 5\%)\ \Omega$. The colour of the third band must be
   a) Green b) Orange c) Yellow d) Red
10. In an oscillating LC circuit, the maximum charge on the capacitor is Q. The charge on the capacitor when the energy is stored equally between the electric and magnetic fields is
    a) $\frac{Q}{\sqrt{3}}$ b) $\frac{Q}{2}$ c) Q d) $\frac{Q}{\sqrt{2}}$
11. Two parallel wires carrying currents in the same direction attract each other because of
    a) Potential difference between them b) Mutual inductance between them
    c) Electric force between them d) Magnetic force between them

12. Which of the following electromagnetic radiation is used for viewing objects through fog?
    a) microwave b) gamma rays c) X- rays d) infrared rays
13. The speed of light in an isotropic medium depends on,
    a) its intensity b) its wavelength
    c) the nature of propagation d) the motion of the source with respect to medium
14. The magnetic energy stored in an inductor of inductance $4\mu H$ carrying a current of 2 A is
    a) 4 mJ b) 8 mJ c) $8\mu J$ d) $4\mu J$
15. The relative magnetic permeability of the medium is 2.5 and the relative electrical permittivity of the medium is 2.25. Compute the refractive index of the medium.
    a) 2.37 b) 5.625 c) 4.75 d) 1.5

PART - II

Answer any six questions. Question no. 24 is compulsory: **6x2=12**

16. What is 'action of points'?
17. Define temperature coefficient of resistivity.
18. Differentiate drift velocity and mobility?
19. State Ampere circuital law.
20. A coil of a tangent galvanometer of diameter 0.24 m has 100 turns. If the horizontal component of Earth's magnetic field is 25×10^{-6} T then, calculate the current which gives a deflection of 60°.
21. Define wattless current.
22. What are Fraunhofer lines?
23. What are the conditions to achieve total internal reflection?
24. Light travels from air into a glass slab of thickness 50 cm and refractive index 1.5. What is the time taken by the light to travel through the glass slab?

PART - III

Answer any six questions. Question no. 28 is compulsory: **6x3-18**

25. Give the applications of capacitors
26. Consider a point charge +q placed at the origin and another point charge -2q placed at a distance of 9 m from the charge +q. Determine the point between the two charges at which electric potential is zero.
27. Derive the expression for resultant capacitance, when capacitors are connected in series .
28. A copper wire of cross-sectional area 0.5 mm^2 carries a current of 0.2 A. If the free electron density of copper is $8.4 \times 10^{28}\ m^{-3}$ then compute the drift velocity of free electrons.
29. Calculate the torque acting on a bar magnet in uniform magnetic field.
30. State Faraday's laws of electromagnetic induction.
31. How will you induce an emf by changing the area enclosed by the coil?
32. List out the properties of electromagnetic waves.
33. Derive the equation for effective focal length for lenses in contact.

PART - IV

Answer all the questions : **5x5=25**

34. a) Derive an expression for electro static potential due to electric dipole. **(Or)**
    b) (i) Define Q-factor?

    (ii) A 500 μH inductor, $\frac{80}{\pi^2}$ pF capacitor and a 628Ω resistor are connected to form a series RLC circuit. Calculate the resonant frequency and Q-factor of this circuit at resonance.
35. a) How the emf of two cells is compared using potentiometer? **(Or)**
    b) Deduce the relation for magnetic induction at a point due to an infinitely long straight conductor carrying current.
36. a) Obtain an expression for electric field due to a uniformly charged spherical shell. **(Or)**
    b) What is emission spectrum? Explain the types of emission spectrum?
37. a) Explain the principle, construction and working of transformer. **(Or)**
    b) Obtain Lens maker formula and mention its significance.
38. a) Explain the working of Cyclotron in detail. **(Or)**
    b) Describe the Fizeau's method to determine speed of light.
