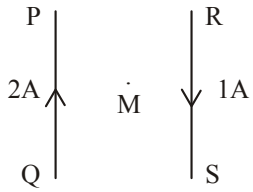
Krishnagar Academy
Pre Annual Examination
PHYSICS Marks : 70
Class XII

SEC -A **1×10=10**

1. The ratio of time period of alpha particle to that of proton circulating with same speed in the same uniform magnetic field is
   (a) $\sqrt{2}:1$ (b) $1:\sqrt{2}$ (c) 1 : 2 (d) 2 : 1
2. A charge q moves in a region, where electric field $\vec{E}$ and magnetic field $\vec{B}$ both exist the force on it is
   (a) $q(\vec{V}\times\vec{B})$ (b) $q\vec{E}+q(\vec{V}\times\vec{B})$ (c) $q\vec{E}+q(\vec{B}\times\vec{V})$ (d) $q\vec{B}+q(\vec{E}\times\vec{V})$
3. The magnetic field at a distance r from a long wire carrying current I is 0.4 tesla. The magnetic field at a distance 2r is
   (a) 0.1 tesla (a) 0.2 tesla (a) 0.8 tesla (a) 1.6 tesla
4. Two paraller wires in free space are 10cm apart and each carries a current of 10A in the same direction. The force exerted by one wire on the other (per metre length is)
   (a) 2×10^{-4} N (attractive) (b) 2×10^{-7} N (attractive) (c) 2×10^{-4} N (Repulsive)
   (d) 2×10^{-7} N (Repulsive)
5. PQ and RS are long parellel conductors separated by a certain distance. M is the mid-point between them net magnetic field at M is B. Now, the current 2A is switched off. The field at M now becomes



   (a) 3B (b) $\frac{B}{2}$ (c) B (d) 2B

6. A wire of length 0.1 m moves with a speed of 10 m/s perpendicular to a magnetic field of induction 1T.What is the magnitude of the emf induced across the wire?

a.10V b.1V c.0.1V d.0.01V

7. The mutual inductance between the primary and the secondary of a transformer is 10H. The induced emf in the secondary when 0.5 A current in primary is cut off in 0.1 second is

a.5V b.50V c.10V d.0.5V

8. The phase relationship between a.c.voltage and current in a pure inductor
a.current lags behind voltage in phase by π/2
b.current leads the voltage in phase by π/2
c.current and voltage in same phase
d.nothing can be said

9. In a series LCR circuit the value of power factor at resonance is
a.0 b.R/Z c.1 d.1/√2

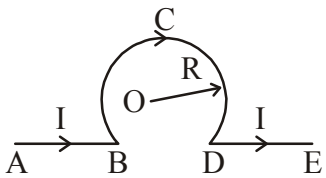
10.The instantaneous value of an alternating current is $I = 10\sqrt{2}\,\sin(100\pi t)$. The effective value of the current is
a.10√2A b.10A c.10/√2A d.√2/10A

SEC-B **2×8=16**

11. Write the relation between the following :
    (i) Direction of propagation and directions of oscillation of the electric and magnatic field vectors in an e.m wave.
    (ii) Velocity of an e.m wave in vaccum and the permeability and permitivity of free space. 1+1
12. (i) What is Bohr megneton?
    (ii) What is the orbital magnetic moment of an electron in hydrogen atom? 1+1
13. Can a uniform magnetic field be used to speed up a charged particle? Explain. 2
14. A Straight wire of lengh 2m and mass 100gm carries current 2A. This wire is hanging in air in the horizontal position due to uniform magnetic field. Calculate the magnitude of the magnetic field. 2
15. Derive an expression for the emf induced between the ends of a metal rod rotated in a magnetic field normally keeping one end fixed.. 2
16. Derive an expression for the self inductance of a long solenoid.. 2
17. The resistance of a coil is 100 ohm and its impedance in an a.c. circuit is $100\sqrt{2}$ ohm. What is its reactance in that circuit ? 2
18. Show that the average power consumed in an ideal capacitor is zero. 2

SEC-C **3×8=24**

19. A long horizontal conductor is bent as shown in figure and carrying current I. Find the magnitude and direction of the magnetic field at the centre of circular part.



20. Find the magnetic field induction at a point due to current following in a long straight conductor.
21. State Biot-Savart's Law. Derive expression for magnetic field at the centre of circular coil of n-turns carrying current (I).
22. Calculate the magnetic field at the centre of a coil in the form of a square of side 4cm carrying a current of 5A.

23. 10A 60 μF capacitor, 0.3 Henry inductor and a 50 ohm resistor are connected in series with a 120 V, 60 Hz source. Calculate

i. the impedance of the circuit

ii. the current in the circuit and

iii. the power dissipated .

24. An alternating emf of 110 V is applied to a circuit containing a resistance of 40 ohm and an inductance L in series .The current is found to lag behind the voltage by an angle $\Phi = \tan^{-1}(3/4)$.

Find

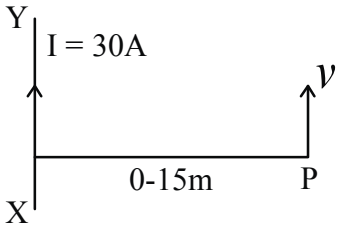
i) the inductive reactance ii) the impedance of the circuit and iii) the current flowing in the circuit.

25. The back emf of a D.C. motor delivering 5 kW of mechanical power is 200V when operating on a 220 V line. Determine the armature current and the motor resistance.

26. A capacitor of 1 microfarad initially charged to 10 V is connected across an ideal inductor of 0.1 millihenry .What will be the maximum current in the circuit ?

SEC-D **4×5=20**

27.



(i) A long wire XY carries a current of 3A. A proton P travels at 2×10^6m/s. parallel to the wire as shown in fig, 0.15m away from it. Find the magnitude and direction of the force which magnetic field exerts on the Proton. 3

(ii) A galvanometer of 24 ohm resistance can carry a full load of 500μA. If it is shunted by a resistance of 3ohm, how much current can this system carry now without damage? 2

28 (i) obtain the formula, I = Kθ for a moving coil galvanometer given the deflecting torque $\vec{\tau} = \vec{m}\times\vec{B}$ where. $\vec{m}$ is the magnetic moment of the coil produced in the magnetic field $\vec{B}$, I is the current in the galvanometer and θ is the deflection. 4

(ii) A proton is moving in a magnetic field of $(2\hat{i} + 3\hat{j})$ Tesla with a velocity $(2\times10^5\,\hat{i})$m/s. Calculate the magnetic force on the particle. 1

29. Show that the average value of the alternating current given by I = IoSin ωt over

i. one complete cycle is Zero. 3

ii. one half cycle is 2Io/π. 2

30. i.Write three advantages of AC over DC. 3

ii. An AC voltage V =Vo Sin ωt is applied across an ideal inductor L.Obtain an expression for the current and hence for the inductive reactance .Draw V-t and I-t graphs showing the phase difference between current and voltage. 2