B.K. BIRLA CENTRE FOR EDUCATION

SARALA BIRLA GROUP OF SCHOOLS
A CBSE DAY-CUM-BOYS' RESIDENTIAL SCHOOL

PRE MID-TERM EXAMINATION

PHYSICS (042)

Class: XII   **Time: 1hr**
Date: 04.08.25   **Max Marks: 25**
Admission no: **Roll no:**

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General Instructions:

(i)   There are three sections A, B, and C with 13 questions in total, Section A has 5 Multiple Choice Questions of one mark each, Section B has 4 questions of two marks each and Section C has 4 questions of three marks each.

(ii)   All questions are compulsory.

(iii)   Calculators are not allowed.

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Section A

1. Which of the following materials exhibit the highest magnetic susceptibility?
    (a) Ferromagnetic material   (b) Paramagnetic material
    (c) Diamagnetic material   (d) None of the above
2. The role of inductance is equivalent to:
    (a) force   (b) inertia   (c) energy   (d) momentum
3. A magnetic needle is kept in a non-uniform magnetic field. It experiences:
    (a) a torque but not a force   (b) neither a force nor a torque
    (c) a force and a torque   (d) a force but not a torque
4. The flux linked with a coil at any instant t is given by $\emptyset = 10t^2 - 50t + 250$. The induced emf at t = 3 s is:
    (a) 10 V   (b) 190 V   (c) -190 V   (d) -10 V

Directions: Question 5 consist of two statements, each printed as Assertion and Reason. Choose any one of the following four responses.
(a) If both Assertion and Reason are correct and the Reason is a correct explanation of the Assertion.
(b) If both Assertion and Reason are correct but Reason is not a correct explanation of the Assertion.
(c) If the Assertion is correct but Reason is incorrect.
(d) If both the Assertion and Reason are incorrect.

5. Assertion: Induced emf will always occur whenever there is change in magnetic flux.
    Reason: Current always induces whenever there is change in magnetic flux.

Section B

6. How does the mutual inductance of a pair of coils change when;
    (i) distance between the coils is decreased and
    (ii) number of turns in the coils is decreased?

7. Depict the behaviour of magnetic field lines near;
    (i) diamagnetic and
    (ii) paramagnetic substances. Justify, giving reasons.

8. A rectangular wire loop of sides 8 cm and 2 cm with a small cut is moving out of a region of uniform magnetic field of magnitude 0.3 T directed normal to the loop.
    What is the e.m.f developed across the cut if velocity of loop is 1 cm s^{-1} in a direction normal to the (i) longer side (ii) shorter side of the loop? For how long does the induced voltage last in, each case?

9. The susceptibility of a magnetic material is -2.6×10^{-5}. Identify the type of magnetic material and state its two properties.

Section C

10. A wheel with 8 metallic spokes each 50 cm long is rotated with a speed of 120 rev/min in a plane normal to the horizontal component of the Earth's magnetic field. The Earth's magnetic field at the place is 0.4 G and the angle of dip is 60°. Calculate the emf induced between the axle and the rim of the wheel. How will the value of emf be affected if the number of spokes were increased?

11. State the Faraday's law of electromagnetic induction. Using it find the expression for motional e.m.f developed in a conductor of length 'L' rotated in uniform magnetic field 'B' with angular velocity 'ω'.

12. State and explain construction, theory and working of an A.C. generator.

13. A coil of 'N' turns and radius 'R' carries a current 'I'. It is unwound and rewound to make a square coil of side 'a' having same number of turns (N). Keeping the current 'I' same, find the ratio of the magnetic moments of the square coil and the circular coil.

--BEST OF LUCK--