ICSE CLASS 10 EXAMINATION

PRACTICE QUESTION PAPER

PHYSICS

Chapter 10 : ELECTRO-MAGNETISM

(Magnetic Effect of Current · Electromagnets · Force on a Current-carrying Conductor and d.c. Motor · Electromagnetic Induction · a.c. Generator · Transformer)

Maximum Marks: 40 **Time allowed: One hour**

1. Answers to this Paper must be written on the paper provided separately.

2. You will not be allowed to write during the first 5 minutes. This time is to be spent in reading the question paper.

3. The time given at the head of this Paper is the time allowed for writing the answers.

*4. **Section A** is compulsory. Attempt **all** questions from Section A and **any two** questions from Section B.*

5. The intended marks for questions or parts of questions are given in brackets [ ].

6. Transformers may be taken as ideal (no loss of energy) unless stated otherwise. Figures are for completion and labelling on the answer sheet.

SECTION A (20 Marks)

(Attempt all questions from this Section.)

Question 1

Choose the correct answers to the questions from the given options. *(Do not copy the question, write the correct answers only.)* **[8]**

(i) The magnetic field lines around a straight current-carrying wire are:

(a) straight lines parallel to the wire (b) concentric circles around the wire

(c) straight lines radially outward (d) ellipses along the wire

(ii) When the current at a face of a circular coil is anticlockwise, that face behaves as a:

(a) north pole (b) south pole

(c) neutral face (d) both poles

(iii) The core of an electromagnet is made of:

(a) copper (b) steel

(c) aluminium (d) soft iron

(iv) In Fleming's left hand rule, the central finger indicates the direction of:

(a) force (b) magnetic field

(c) current (d) induced e.m.f.

(v) Assertion (A): A transformer cannot work on d.c. supply.

Reason (R): A d.c. current in the primary produces a constant magnetic flux, so no e.m.f. is induced in the secondary.

(a) (A) is true and (R) is false.

(b) (A) is false and (R) is true.

(c) Both (A) and (R) are true, and (R) is the correct explanation for (A).

(d) Both (A) and (R) are true, but (R) is not the correct explanation for (A).

(vi) A transformer has 100 turns in the primary and 500 turns in the secondary. If 20 V a.c. is applied to the primary, the output voltage is:

(a) 4 V (b) 20 V

(c) 100 V (d) 500 V

(vii) The energy conversion in an a.c. generator is from:

(a) electrical to mechanical (b) mechanical to electrical

(c) chemical to electrical (d) electrical to heat

(viii) The direction of the induced current in a conductor moving in a magnetic field is given by:

(a) Fleming's left hand rule (b) Fleming's right hand rule

(c) right hand thumb rule (d) clock rule

Question 2

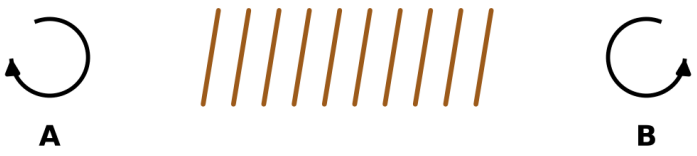
(a) What is an electromagnet? Name the material used for its core. **[2]**

(b) Fig. 1 shows a solenoid carrying a current. The current is clockwise at the face A and anticlockwise at the face B. **[3]**

(i) Name the polarity at the faces A and B. **[1]**

(ii) Draw the magnetic field lines inside and outside the solenoid and mark their direction. **[1]**

(iii) State what happens to the field inside if a soft iron bar is placed along its axis. **[1]**



current is clockwise at face A and anticlockwise at face B

Fig. 1

(c) State one advantage of a.c. over d.c. for transmission of electric power. **[1]**

Question 3

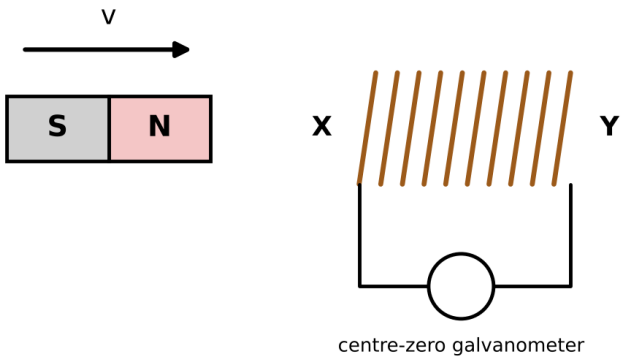
(a) A coil of 100 turns is linked with a magnetic flux which increases uniformly from 2×10^{-3} Wb to 8×10^{-3} Wb in 0.05 s. Calculate (i) the change in flux, (ii) the rate of change of flux per turn, and (iii) the e.m.f. induced in the coil. **[3]**

(b) In Fig. 2 a bar magnet is moved towards a coil XY connected to a centre-zero galvanometer G, with its north pole facing the coil. **[3]**

(i) State the observation in the galvanometer. **[1]**

(ii) State the polarity induced at the end X of the coil and name the law used. **[1]**

(iii) What will be observed if the magnet is held stationary inside the coil? Give a reason. **[1]**



centre-zero galvanometer

Fig. 2

SECTION B (20 Marks)

(Attempt any two questions from this Section.)

Question 4

(a) A wire of length 0.5 m carries a current of 4 A in a magnetic field of strength 0.2 T. Calculate the force on the wire when (i) the wire is perpendicular to the field, (ii) the wire is parallel to the field, and (iii) the current is doubled and the length is halved with the wire perpendicular to the field. **[3]**

(b) Give a reason for each of the following: (i) Soft iron is used as the core of an electromagnet. (ii) A split ring commutator is used in a d.c. motor. (iii) The core of a transformer is laminated. **[3]**

(c) Fig. 3 shows a rectangular coil ABCD in the plane of the paper placed between the poles of a magnet. A battery is connected between the ends A and D of the coil, with its positive terminal on the side of D. **[4]**

(i) State the direction of the current in the coil. **[1]**

(ii) State the direction of the force on each of the arms AB, BC, CD and DA. **[2]**

(iii) What is the effect on the coil if the connections of the battery are interchanged? **[1]**

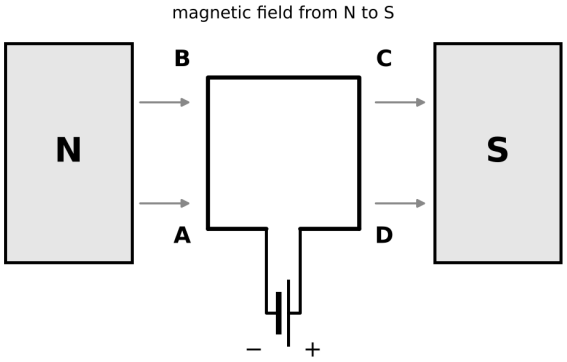


Fig. 3

Question 5

(a) State three differences between an electromagnet and a permanent magnet. **[3]**

(b) Fig. 4 shows two long straight parallel wires A and B perpendicular to the plane of the paper carrying equal currents, into the page in A and out of the page in B. K is the mid-point of the line joining them. **[3]**

(i) Name the rule used to find the direction of the magnetic field around a wire. **[1]**

(ii) State the direction of the field at K due to A and due to B. **[1]**

(iii) What is the direction and relative strength of the resultant field at K? **[1]**

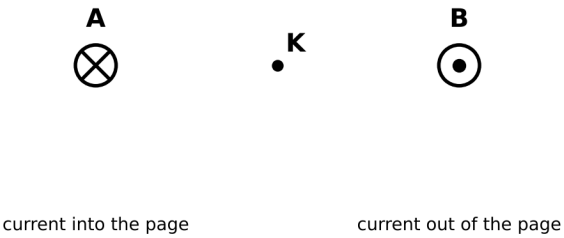


Fig. 4

(c) Fig. 5 shows a transformer with 1000 turns in the primary coil and 100 turns in the secondary coil. The primary is connected to a 220 V a.c. supply and the secondary delivers a current of 5 A. **[4]**

(i) State whether it is a step-up or a step-down transformer. **[1]**

(ii) Calculate the e.m.f. across the secondary coil. **[1]**

(iii) Calculate the current in the primary coil. **[1]**

(iv) Which coil is made of thicker wire? Give a reason. **[1]**

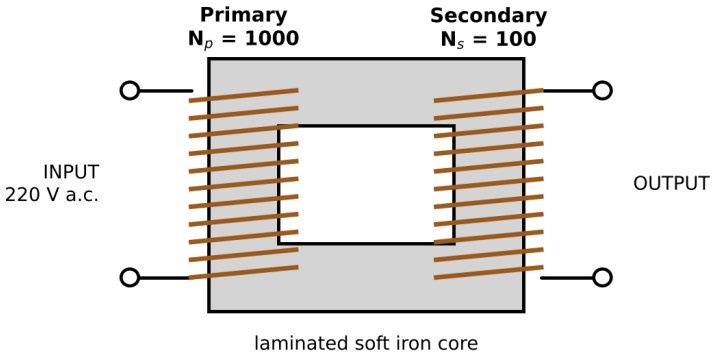


Fig. 5

Question 6

(a) State three differences between an a.c. generator and a d.c. motor. **[3]**

(b) (i) State Lenz's law. (ii) State Faraday's law of electromagnetic induction regarding the magnitude of induced e.m.f. (iii) Name the energy conversion that takes place in a generator. **[3]**

(c) Fig. 6 shows the variation of the e.m.f. induced in the coil of an a.c. generator with the angle turned by the coil. P, Q, R, S and T are points on the graph. At P the plane of the coil is perpendicular to the magnetic field. **[4]**

(i) State the position of the coil with respect to the field at Q. **[1]**

(ii) Name the points at which the e.m.f. is maximum. **[1]**

(iii) The coil completes one rotation from P to T in 0.02 s. Find the frequency of the a.c. **[1]**

(iv) What happens to the frequency and the maximum e.m.f. if the speed of rotation is doubled? **[1]**

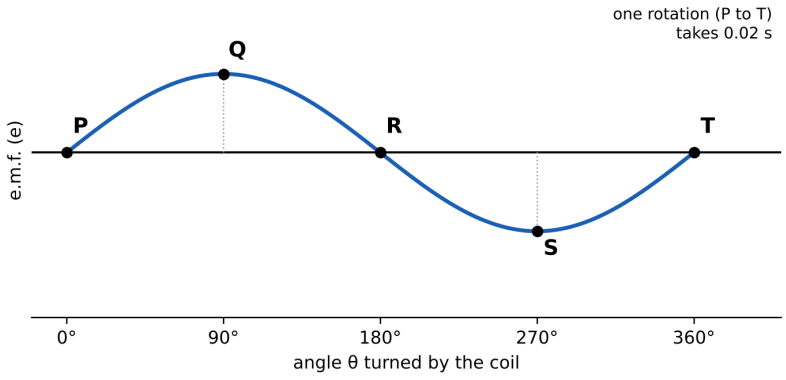


Fig. 6

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