UNIT-19 ELECTROMAGNETIC INDUCTION

UNIT = 19   ELECTROMAGNETIC INDUCION

MULTIPLE CHOICE QUESTIONS (BOOK XII)

1. Electricity production by magnetism involves

    (a)   The conversion of chemical energy to electrical energy.

    (b)   The use of static electricity for power generation.

    (c)   The movement of conductors within magnetic fields.

    (d)   The absorption of solar energy by photovoltaic cells.

2. Induced e.m.f can be generated by relative movement, known as the generator effect, and by changing magnetic fields, known as the transformer effect.

    (a)   True in transformers only.

    (b)   False in all cases.

    (c)   Applicable to both cases.

    (d)   True only for static magnetic fields.

3. The magnitude of induced e.m.f. increases with

    (a)   The decrease in the speed of the conductor's motion.

    (b)   The decrease in the strength of the magnetic field.

    (c)   The increase in the number of turns in the coil.

    (d)   The reduction in the area of the coil.

4. Faraday's law of electromagnetic induction states

    (a)   That current in a circuit always opposes the change in magnetic flux.

    (b)   That the induced e.m.f. is directly proportional to the rate of change of magnetic flux.

    (c)   That a changing electric field produces a magnetic field.

    (d)   That magnetic fields can only be produced by electric currents.

5. Lenz's law predicts the direction of an induced current

    (a)   to conserve electric charge.

    (b)   by stating that the induced current will oppose the change causing it.

    (c)   by following the direction of the applied magnetic field.

    (d)   based on the magnitude of the electric field.

6. Eddy currents produce:

    (a) static electricity in conductive materials.

    (b) Alternating magnetic fields with no heating effects.

    (c) magnetic fields that oppose the inducing field and cause heating in conductors.

    (d) uniform electric fields that have no impact on power generation.

7. Laminated iron cores are used in electric motors and transformers to

    (a) reduce the weight of the device.

    (b) Enhance the mechanical strength.

    (c) Minimize eddy current losses and reduce heating.

    (d) Increase the magnetic permeability of the core.

8. Self-induction is the phenomenon where

    (a) A changing electric field induces a magnetic field.

    (b) A changing magnetic field within a coil induces an emf in the same coil.

    (c) A constant magnetic field induces a constant emf.

    (d) Two coils induce emf in each other through mutual induction.

9. An inductor stores electric potential energy in:

    (a) The electric field around it.

    (b) The magnetic field within its coil.

    (c) The capacitance of its windings.

    (d) The heat generated by its resistance.

I 0. Transformers work on the principle of

    (a) converting direct current (DC) to alternating current (AC).

    (b) electromagnetic induction between primary and secondary coils.

    (c) generating electricity through chemical reactions.

    (d) using permanent magnets to maintain a constant voltage.

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EXAMS PRACTICE MULTIPLE CHOICE QUESTIONS

1   Transformer ratings are given in _____
(a)   KVa   (b) HP
(c)   kVAR   (d) kW

2   Which phenomenon primarily contributes to the core losses in a voltage transformer?

(a) Eddy currents   (b) Hysteresis

(c) **Both A and B**   (d) Neither A nor B

3   A 100-turn coil of area 0.1 m² rotates at half a revolution per second. It is placed in a uniform magnetic field of 0.01 T perpendicular to the axis of rotation of the coil. Calculate the maximum voltage generated in the coil.

(a) 256.33 V   (b) 89.12V

(c) 0.314 V   (d) 3.1455 V

4   Identify the principle behind the working of an a.c. generator.

(a) Eddy currents   (b) Faraday's law

(c) Lenz's law   **(d) Electromagnetic induction**

5   Which among the following is true about Faraday's law of Induction?

(a) An emf is induced in a conductor when it cuts the magnetic flux

(b) An emf is induced in a conductor when it moves parallel to the magnetic field

(c) An emf is induced in a conductor when it moves perpendicular to the magnetic field

(d) An emf is induced in a conductor when it is just entering a magnetic field

6   Faraday's laws are the result of the conservation of which quantity?

(a) Momentum   **(b) Energy**

(c) Charge   (d) Magnetic field

7   The magnetic flux in a closed circuit of resistance 20 Ω varies with time t as $\Phi = 4t^3 + 2t^2 - 15t + 3$. Calculate the magnitude of the induced emf at t = 1s.

(a) 3 V   **(b) 1 V**   (c) 5 V   (d) 6 V

Hint

$(\Phi = 4t^3 + 2t^2 - 15t + 3$ $taking\ derivative\ on\ both\ side)$

$$\left\{ \frac{\Phi}{\Delta t} = 12t^2 + 4t - 15 \quad \Rightarrow \quad emf = 12(1)^2 + 4(1) - 15 \right\}$$

8 Which law is used to find the current direction in an a.c. generator?

(a) Maxwell's law **(b) Lenz's law**

(c) Corkscrew law (d) Ampere's circuital law

9 Identify the law used to find the direction of eddy currents.

(a) Lenz's law (b) Maxwell's law

(c) Ampere's law (d) Faraday's law

10 If a number of turns in a coil is increased from 10 to 100, its inductance becomes _____ times the original value.

(a) 10 **(b) 100**

(c) $\frac{1}{10}$ (d) 25

11 Mutual inductance of a system of two coils is 0.3 H. If the current in the one coil is changed from 10 A to 40 A in 0.01 sec, the average induced emf in the other coil is _____ volt.

(a) 9 **(b) 900**

(c) 9000 (d) 90000

12 Weber is the unit of:

(a) Magnetic field intensity (b) magnetic induction

(c) magnetic flux (d) self-inductance

13 The practical application of the phenomenon of mutual inductance is:

(a) AC generator **(b) transformer**

(c) rectifier (d) dynamo

14 SI unit of induction is:

(a) Tesla **(b) Henry**

(c) Watt (d) Weber

15 1 Tesla is equal to:

(a) $\frac{newton}{Coulomb \times metre}$ (b) $\frac{newton}{ampere \times metre}$

(c) $\frac{ampere}{newton \times metre}$ (d) $\frac{ampere \times metre}{newton}$

16 A transformer is used to change :

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(a)   capacitance   (b)   frequency

(c)   voltage   (d)   power

17   In a step-down transformer;
(a) $N_S > N_P$ (b) $N_S < N_P$
(c) $N_S = NP$ (d) $N_P = N_S$

18   In a step-down transformer;
(a) $N_S > N_P$ (b) $N_S < N_P$
(c) $N_S = NP$ (d) $N_P = N_S$

19   Which rule determines the current direction induced in a conductor moving through a magnetic field?
(a) Ampere's Rule   (b) Fleming's Left-Hand Rule
(c) Fleming's Right-Hand Rule   (d) Kirchhoff'

20   The self-inductance of a coil is independent of:
(a) Current   (b) Time
(c) Induced voltage   **(d) Resistance of the coil**

21   The basic difference between an AC generator and a DC generator is that
(a) An AC generator has an electromagnet, while a DC generator has a permanent magnet
(b) An AC generator has slip rings while a DC generator has a commutator
(c)   DC generators will generate a higher voltage
(d)   An AC generator will generate a higher voltage

22   The application of an electric motor is to
(a) convert voltage into current   (b) transfer charge into current
(c) transfer electrical energy into mechanical energy   (d)   Convert current into voltage

23   Which of the following devices work on the principle of electromagnetic induction?
(a)   Electric kettle   **(b)   Electric generator**
(c)   Electric lamp   (d)   Electric heater

24   If the rotational velocity of a dynamo armature is doubled, then the induced emf will
(a)   become half   **(b)   become double**
(c)   remain unchanged   (d)   become four times

25   Doubling the diameter of a loop of wire produces what kind of change in the induced emf, assuming all other factors remain constant?
(a)   The induced emf is 4 times as much.   (a) The induced emf is twice as much.
(a)   The induced emf is half as much.   (a) There is no change in the induced emf.