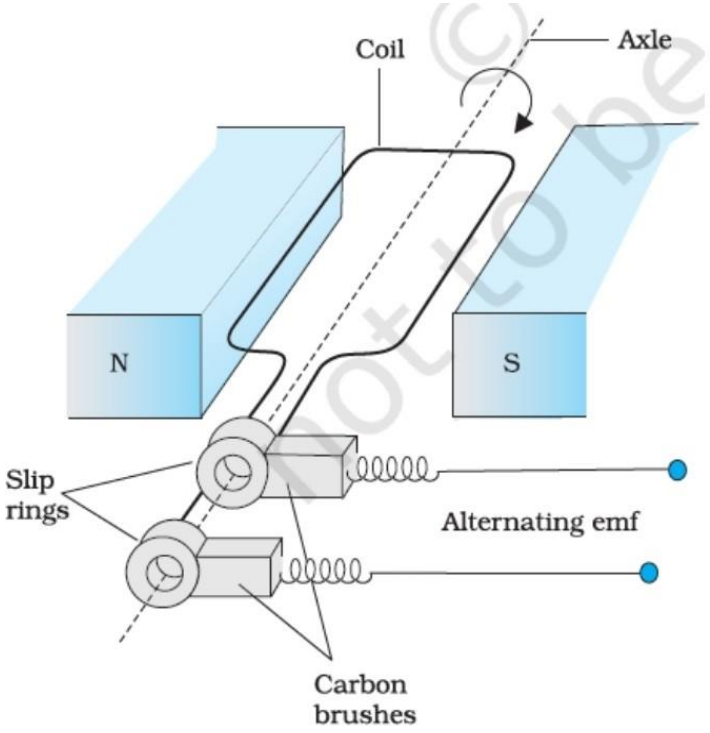
KVS RO BPL(CLASS XII CBT-PHYSICS SEPTEMBER 2023-24)

QUESTION PAPER FOR CLSASS XII CBT SEPTEMBER 2023-24
CLASS :-XII
SUBJECT :-PHYSICS
TOPIC :- AC GENERATOR AND TRANSFORMER

CASE STUDY-1

AC GENERATOR

The phenomenon of electromagnetic induction has been technologically exploited in many ways. An exceptionally important application is the generation of alternating currents (ac). The modern ac generator with a typical output capacity of 100 MW is a highly evolved machine. The Yugoslav inventor Nicola Tesla is credited with the development of the machine. As was you know one method to induce an emf or current in a loop is through a change in the loop's orientation or a change in its effective area. As the coil rotates in a magnetic field B, the effective area of the loop (the face perpendicular to the field) is , where is the angle between A and B. This method of producing a flux change is the principle of operation of a simple ac generator. An ac generator converts mechanical energy into electrical energy



1. The magnetic flux (in SI units) through a coil varies with time as $\varphi = 3t^2 + 4t + 7$. The ratio of emf induced in the coil at t = 2 s to that at t = 1 s will be :

- (a) 2
- (b) 0·8
- (c) 1·6
- (d) 4

Ans –c

Feedback - induced emf = $d\varphi/dt = 6t + 4$
Induced emf at t=2s, e= 6*2+4 = 16 V
Induced emf at t=1s, e= 6*1+4 = 10 V
Ratio = 16/10 =1.6

2. In an AC generator, a coil with N turns, all of the same area A and total

* resistance R, rotates with frequency w in a magnetic field B. The maximum value of emf generated in the coil is:

- (a) NABRw
- (b) NAB
- (c) NABR
- (d) NABw

Ans – d

Feedback - maximum emf is given by NBAw

3. The magnitude of induced current is maximum if the coil and magnetic field are… *

- a) perpendicular
- b) parallel
- c) inclined at 45 degree
- d) all of these

Ans - a

Feedback - as emf is NBAwsinΘ and current I= e/r so, for maximum current Θ = 90 degree

4. If the output of an A.C. generator is E = 170 sin 377t, then the frequency will be:

- (a) 50Hz
- (b) 110Hz

(c) 60Hz

(d) 230Hz

Ans - c

Feedback - $\omega = 377$ or $2\pi f = 377$

$f = 377/2\pi = 377/6.28 = 60Hz$

5. Assertion-Reasoning Question:

Assertion (A): The self inductance (volume) of an ideal solenoid is proportional to square of number of turns per unit length.

Reason (R): Magnetic field inside an ideal solenoid is proportional to number of turns per unit length.

(A) Both A and R are true and R is the correct explanation of A.

(B) Both A and R are true but R is not the correct explanation of A.

(C) A is true but R is false.

(D) A is false and R is also false.

Ans – a

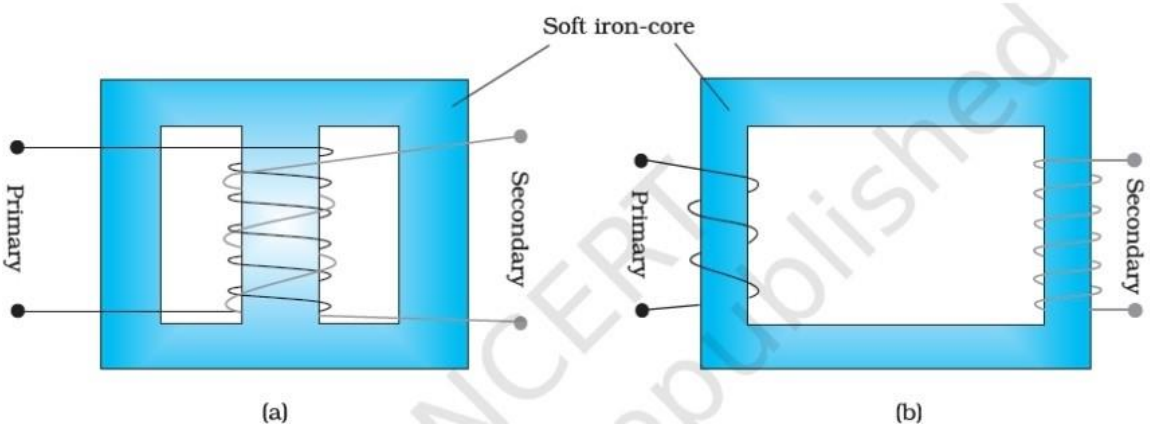
Feedback - self inductance is $\mu_0 n^2 Al$

Magnetic field indide a solonide is $\mu_0 nI$

CASE STUDY - 2

TRANSFORMERS

For many purposes, it is necessary to change (or transform) an alternating voltage from one to another of greater or smaller value. This is done with a device called transformer using the principle of mutual induction. A transformer consists of two sets of coils, insulated from each other. They are wound on a soft-iron core, either one on top of the other as shown in figure (a) or on separate limbs of the core as shown in figure(b). One of the coils called the primary coil has Np turns. The other coil is called the secondary coil; it has Ns turns. Often the primary coil is the input coil and the secondary coil is the output coil of the transformer. When an alternating voltage is applied to the primary, the resulting current produces an alternating magnetic flux which links the secondary and induces an emf in it. The value of this emf depends on the number of turns in the secondary.



6. A transformer steps up 220 volt A.C. supply to 2200 volts. If its secondary coil has 2000 turns, the number of turns in the primary coil will be:

(a) 200

(b) 100

(c) 50

(d) 20

Ans – a

Feedback - N1/N2=V1/V2 OR N1/V1 = N2/V2

N1/220=2000/2200

N1=200

7. In a transformer the ratio 10 : 1 indicates:

(a) The primary coil has 10 turns and the secondary has 1.

(b) The magnitude of voltage of the secondary is (1/10) times the primary.

(c) The current in the primary coil is 10 times that in the secondary.

For every 10 turns in the primary, there will be 1 turn in the secondary.

Ans - c

Feedback - CURRENT IS 10 TIMES IN PRIMARY COIL

8. In a transformer, the primary coil has 100 turns and the secondary, 200 turns. If the primary coil of this transformer of 50% efficiency is connected to an A.C. of 220 volts and 10 amp current, the correct statement out of the following for the secondary coil is:

(a) voltage is 440 volts and 2.5 amp current

(b) voltage is 440 volts and 5 amp current.

(c) voltage is 110 volts and 5 amp current.

(d) voltage is 110 volts and 10 amp current.

Ans - a

Feedback- V2/V1= N2/N1

V2/220 = 200/100

V2 = 440

As voltage is double so current becomes half i.e. 5A but efficiency is 50% so current further decreases to 2.5 A

9. A step-up transformer increases ?

(a)power (b)current (c)voltage d)frequency

Ans - c

Feedback - voltage

10. Assertion-Reasoning Question:

Assertion: AC source is connected across a circuit. Power dissipated in circuit is 'P'. The power is dissipated only across resistance.

Reason: Inductor and capacitor will not consume any power in AC circuit.

(A) Both A and R are true and R is the correct explanation of A.

(B) Both A and R are true but R is not the correct explanation of A.

(C) A is true but R is false.

(D) A is false and R is also false.

Ans - a

Feedback - both statements are correct

Answer Key SEPTEMBER Month CBT Physics XII

Q No	Answer
1	c
2	d

3	a
4	c
5	a
6	a
7	c
8	a
9	c
10	a

Feedback:

1. Average score in this test is 5.56/10
2. Question 2,3, and 9 are scored by most of the students,
3. Question 1,7 and 10 is scored by least No of students.
4. Median marks scored by students is 6