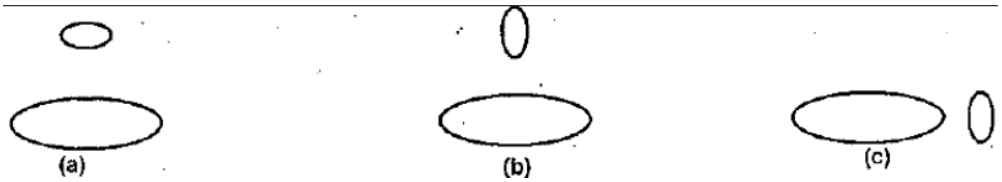
KENDRIYA VIDYALAYA BHU IST SHIFT

CLASS-XII. SUB- PHYSICS Total Marks : 40

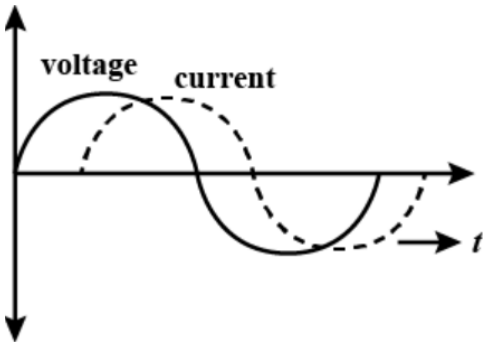
MONTHLY TEST(SEPTEMBER)

*** Choose The Right Answer From The Given Options.[1 Marks Each]** [7]

1. The value of mutual inductance can be increased by.
   (A) decreasing N
   (B) increasing N
   (C) winding the coil on wooden frame
   (D) winding the coil on china clay
2. Which of the following are not units of self inductance?
   (A) Weber/m^2 (B) Ohm−second
   (C) Joule−ampere
   (D) Joule−ampere−2
3. The number of turns in an air core solenoid of length 25cm and radius 4cm is 100. Its self inductance will be.
   (A) 5×10^{-4}H (B) 2.5×10^{-4}H (C) 5.4×10^{-3}H (D) 2.5×10^{-3}H
4. Two circular coils can be arranged in any of the three situations shown in the figure. Their mutual inductance will be.



   (A) maximum in situation (A)
   (B) maximum in situation (B)
   (C) maximum in situation (C)
   (D) the same in all situations
5. The AC produced in India changes its direction in every:
   (A) $\frac{1}{100}$second (B) 100 second (C) 50 second (D) None of these
6. The diagram given show the variation of voltage and current in an AC circuit. The circuit contains.



(A) Only a resistor (B) Only a pure inductor

(C) Only a capcacitor (D) A capacitor and and inductor

7. When the frequency of AC is doubled, the impedance of an LCR series circuit:

(A) is halved (B) is doubled (C) increases (D) decreases

*** a statement of Assertion (A) is followed by a statement of Reason (R). [1]**
Choose the correct option.

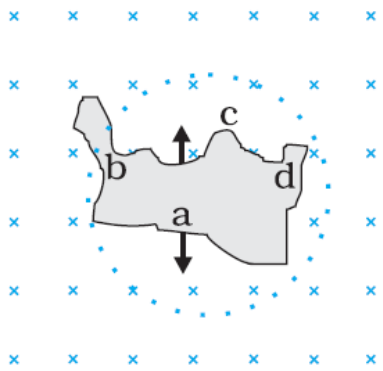
8. For two statements are given-one labelled Assertion (A) and the other labelled Reason (R). Select the correct answer to these questions from the codes (a), (b), (c) and (d) as given below.
   a. Both A and R are true and R is the correct explanation of A.
   b. Both A and R are true but R is not the correct explanation of A.
   c. A is true but R is false.
   d. A is false and R is also false.

Assertion: A bulb connected in series with a solenoid is connected to A.C. source. If a soft iron core is introduced in the solenoid, the bulb will glow brighter.

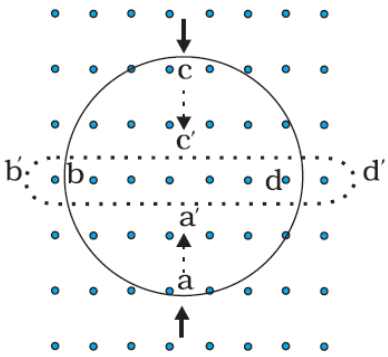
Reason: On introducing soft iron core in the solenoid, the inductance decreases.

*** Given Section consists of questions of 2 marks each. [10]**

9. Use Lenz's law to determine the direction of induced current in the situations described by Fig.
   a. A wire of irregular shape turning into a circular shape;



b. A circular loop being deformed into a narrow straight wire.



10. Current in a circuit falls from 5.0A to 0.0A in 0.1s. If an average emf of 200V induced, give an estimate of the self-inductance of the circuit.

11. A $15.0\mu F$ capacitor is connected to a $220V, 50Hz$ source. Find the capacitive reactance and the current (rms and peak) in the circuit. If the frequency is doubled, what happens to the capacitive reactance and the current?

12. A lamp is connected in series with a capacitor. Predict your observations for dc and ac connections. What happens in each case if the capacitance of the capacitor is reduced?

13. A 100Ω resistor is connected to a 220V, 50Hz ac supply.
    a. What is the rms value of current in the circuit?
    b. What is the net power consumed over a full cycle?

*** Given Section consists of questions of 3 marks each.** **[12]**

14. a. Define mutual inductance.
    b. A pair of adjacent coils has a mutual inductance of 1.5 H. If the current in one coil changes from 0 to 20 A in 0.5 s, what is the change of flux linkage with the other coil?

15. i. Define self-inductance. Write its SI units.
    ii. A long solenoid with 15 turns per cm has a small loop of area 2.0 cm^2 placed inside the solenoid normal to its axis. If the current carried by the

solenoid changes steadily from 2.0 A to 4.0 A in 0.1 s, what is the induced emf in the loop while the current is changing?

16. Two concentric circular coils, one of small radius r_1 and the other of large radius r_2, such that $r_1 \ll r_2$, are placed co-axially with centres coinciding. Obtain the mutual inductance of the arrangement.

17. A resistance R and a capacitor C are connected in series to a source $V = V_0 \sin \omega t$.

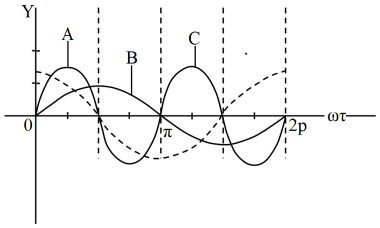
Find:

a. The peak value of the voltage across the (i) resistance and (ii) capacitor.

b. The phase difference between the applied voltage and current. Which of them is ahead?

*** Given Section consists of questions of 5 marks each.** **[10]**

18. A device 'X' is connected to an ac source $V = V_0 \sin \omega t$. The variation of voltage, current and power in one cycle is show in the following graph:



i. Identify the device 'X'.

ii. Which of the curves, A, B and C represent the voltage, current and the power consumed in the circuit? Justify your answer.

iii. How does its impedance vary with frequency of the ac source? Show graphically.

iv. Obtain an expression for the current in the circuit and its phase relation with ac voltage.

19. A series LCR circuit with L = 0.12H, C = 480nF, R = 23Ω is connected to a 230V variable frequency supply.

a. What is the source frequency for which current amplitude is maximum. Obtain this maximum value.

b. What is the source frequency for which average power absorbed by the circuit is maximum. Obtain the value of this maximum power.

c. For which frequencies of the source is the power transferred to the circuit half the power at resonant frequency? What is the current amplitude at these frequencies?

d. What is the Q-factor of the given circuit?

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