ALTERNATING CURRENT

PHYSICS (12^{TH}) FM-35

A) ANSWER ANY FIVETEEN QUESTIONS.(1*15=15)

1. In a series LñCñR circuit, voltages across inductor, capacitor, and resistor are VL, VC and VR respectively. What is the phase difference between (i) VL and VR (ii) VL and VC?
2. Why canít transformer be used to step up or step down dc voltage?
3. In an a.c. circuit, instantaneous voltage and current are V = 200 sin 300 t volt and i = 8 cos 300t ampere respectively. What is the average power dissipated in the circuit?
4. Sketch a graph that shows change in reactance with frequency of a series LCR circuit.
5. In a circuit instantaneously voltage and current are V = 150 sin 314t volt and i = 12 cos 314t ampere respectively. Is the nature of circuit is capacitive or inductive ?
6. In a series LñCñR circuit VL = VC ≠ VR. What is the value of power factor?
7. In an inductor L, current passed I0 and energy stored in it is U. If the current is now reduced to I0/2, what will be the new energy stored in the inductor?
8. Current versus frequency (I ñ v) graphs for two different series LñCñR circuits have been shown in adjoining diagram. R1 and R2 are resistances of the two circuits. Which one is greaterñR1 or R2?
9. What are the values of capacitive and inductive reactance in a dc circuit?
10. DeÆne RMS Value of Current.
11. Power factor of an ac circuit is a measure of:
    (a) virtual power (b) power lost in the circuit (c) mean power (d) all the above
12. The dimensional formula of L/R is similar to that of:
    (a) frequency(b) time(c) length(d) none of these
13. Energy dissipates in LCR circuit in :
    (a) L only(b) C only(c) R only(d) All of the above
14. An acceptor circuit is :
    (a) series resonant circuit(b) parallel resonant circuit(c) LCR circuit (d) None of these
15. In series resonant circuit:
    (a) reactance is zero(b) current is zero (c) voltage is zero (d) None of these
16. In parallel resonant circuit:
    (a) impedance is very high (b) current is very high (c) voltage is very high (d) None of these
17. Which of the following effects is not shown in alternating current ?
    (a) Chemical effect(b) Magnetic effect (c) Heating current (d) All of these

B) ANSWER ANY FIVE QUESTIONS.(2 * 5 = 10)

1. *a)The peak voltage of an ac supply is 300 V. What is the rms voltage?b) The rms value of current in an ac circuit is 10 A. What is the peak current?*
2. *A 44 mH inductor is connected to 220 V, 50 Hz ac supply. Determine the rms value of the current in the circuit.*
3. *A 60 µF capacitor is connected to a 110 V, 60 Hz ac supply. Determine the rms value of the current in the circuit.*
4. *Obtain the resonant frequency ω_r of a series LCR circuit with L = 2.0H, C = 32 µF and R = 10 Ω. What is the Q-value of this circuit?*
5. *A charged 30 µF capacitor is connected to a 27 mH inductor. What is the angular frequency of free oscillations of the circuit?*
6. *A series LCR circuit with R = 20 Ω, L = 1.5 H and C = 35 µF is connected to a variable-frequency 200 V ac supply. When the frequency of the supply equals the natural frequency of the circuit, what is the average power transferred to the circuit in one complete cycle?*

C) ANSWER TWO QUESTIONS (5 * 2 =10)

1. Explain, with the help of a neat and labelled diagram, the principle, construction and working of a transformer?(5 marks)
2. An LC circuit contains inductor of inductance L and capacitor of capacitance C with an initial charge q0. The resistance of the circuit is negligible. Let the instant the circuit is closed be t = 0. (i) What is the total energy stored initially? (ii) What is the maximum current through inductor? (iii) What is the frequency at which charge on the capacitor will oscillate? (iv) If a resistor is inserted in the circuit, how much energy is eventually dissipated as heat?(5 marks)

----------BEST OF LUCK----------

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