PHYSICS

BOOKS - R G PUBLICATION

ALTERNATING CURRENT

Exercise

1. The frequency of a.c. is doubled. How do X_L and X_C get affected?

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2. If L and R reperesnt respectively the inductance and resisitance the dimensions of L/R are

3. What is eddy current? State two applications of eddy current.

4. Show that the mean value of complete G.C. cycle is zero.

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5. In a series LCR circuit in which $R = 3\Omega$, L=25mH and $C = 800\mu F$ a sinusoidal a.c. voltage of peak value 250 V is applied. Find frequency at which resonance occurs

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6. In a series LCR circuit in which $R = 3\Omega$, L=25mH and $C = 800\mu F$ a sinusoidal a.c. voltage of peak value 250 V is applied. Find current in the circuit at resonant condition.

7. What is step up and step down transformer?

To transfer electric energy from generating station initially step up transformer is used. Why?
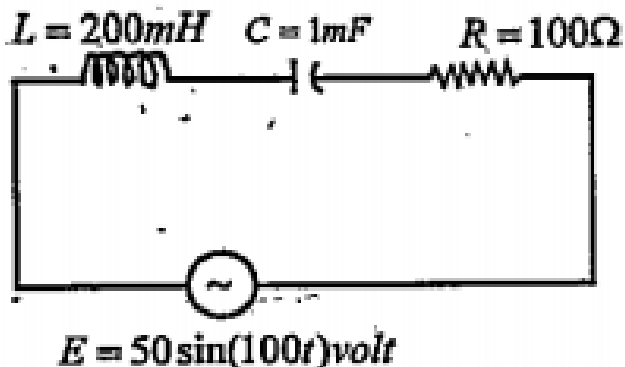
8. Describe in brief the concept of displacement.

9. Find the peak current in the circuit given below.

$L = 200mH$ $C = 1mF$ $R = 100\Omega$

$E = 50\sin(100t)volt$

10. what is power factor of an L-C-R circuit? Explain on the basis of power factor than an ideal inductor is a Wattless component.

11. Why is electrical energy transmitted at high voltage from a distance power generating station?

12. An AC source of emf $E = 200\sin(100\pi t)$ is connected across an inductor having resistance 100Ω and self inductance 2H. Calculate Frequency of AC.

13. An AC source of emf $E = 200\sin(100\pi t)$ is connected across an inductor having

resistance 100Ω and self inductance 2H.

Calculate- Total impedance of the circuit.

14. An AC source of emf $E = 200 \sin(100\pi t)$ is connected across an inductor having resistance 100Ω and self inductance 2H. Calculate-Peak value of current flowing through the circuit.

15. State the working principle of a transformer. What is hysteresis loss in transformer?

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16. Briefly explain the working of A.C. generator.

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17. An a.c. source of e.m.f. $V_m \sin wt$ is connected with a circuit which contains an inductorL, a capacitor C and a resistor R in series. Establish the differential equation of e.m.f and find the total impedance of the series LCR circuit. What is quality factor of the circuit.

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18. A 40W-110V bulb is to be used in 220V-50Hz AC. Calculate the inductance required for this purpose.

19. Explain the physical proces on the basis of which the r.m.s value of AC is defined? Derive the expression for r.m.s value of an alternating voltage. How does the value of Capacitative voltage. How does the value of Capacitative

reactance of a capacitor change with the frequecny of the applied alternating e.m.f across it.

20. A charged capacitor is connected to an inductor at an instant of time t=0.If the capacitor and the inductor are taken to be pure, write down the equation of effective potential difference across the combination at any instant of time t and solve it for

instantaneous current through I the combination.Explain brefly the exchange of electric and magnetic energy between the capacitor and the inductor.

21. Show that average power dissipated by a pure inductor and a pure capacitor are zero when they are connected to an AC voltage source.

22. The amplitude of current in series LCR circuit connected to an AC frequency "omega" is given by

$$i_m = \frac{v_m}{\sqrt{R^2 + (X_L - X_C)^2}}$$

Where X_L and X_C are inductive and capacitative reactances respectively and v_m is amplitude of voltage. Starting fron this equation show that sharpness of resonance in the circuit is equal to the quality factor of the circuit.

23. Fill in the blanks

For an alternating current $i = i_m \sin \omega t$, passing through a resistor R, the average power loss p due to joule heating is_____.

24. Fill in the blanks

The voltage of 220 v in an rms value with a peak value of _____

25. Fill in the blanks

At resonant frequency the current amplitude

is__ and i_m __ _

26. Fill in the blanks

The ratio $\left(W_o \dfrac{L}{R} \right)$ is called _____.

27. Fill in the blanks

The average power supplied to an inductor over one complete cycle is _____.

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28. Fill in the blanks

Transformer use the principle of__

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29. What is alternating current?

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30. What is root mean square value of current?

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31. What is quality factors?

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32. What is impedance?

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33. Deduce the expression for instantaneous power supplied to a capacitor when the capacitor is connected to an ac source.

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34. What is capacitive reactance?

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35. What is power factor?

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36. What is Iron in transformer?

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37. Can a transformer work on d.c.?

38. What is meant by form factor?

39. What is peak value of 220V a.c.?

40. What is meant by watless current?

41. Does the steady state current in RL circuit depend upon L.

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42. What is the average value of a.c. over a complete cycle?

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43. What is the relation between mean value and peak value in a.c.

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44. What is the relation between r.m.s value and peak value?

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45. Can we use a capacitor instead of choke coil for reducing a.c.

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46. What is the minimum value of power factor?

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47. What is the phase difference between voltage and current in L-C-R circuit at resonance?

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48. What is meant by electric inertia?

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49. What is the impedance of a pure inductance?

50. Show that an alternating voltage $V = V_m \sin \omega t$ applied to a resistor R drives a current $i = i \sin \omega t$ in the resistor.

51. A light bulb is rated at 60w for a 230 v supply. Find the resistance of the bulb

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52. A light bulb is rated at 60w for a 230 v supply. Find the peak voltage of the source.
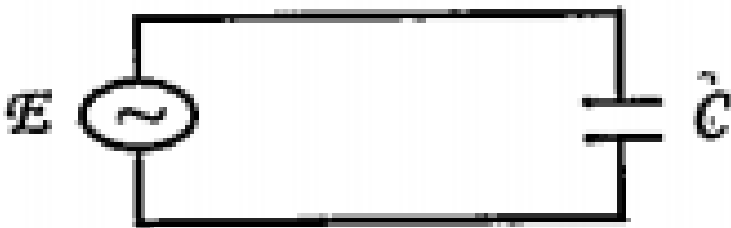
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53. A light bulb is rated at 60w for a 230 v supply. Find the rms current through the bulb

54. Draw the phasor diagram and graph of v versus io for the circuit below:

55. Draw the graphs of ν and I versus ωt for a series LCR circuit when $X_C > X_L$.

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56. Write a short note on resonance.

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57. Write the different applications of resonant circuit.

58. Write a short note on sharpness of resonance.

59. What are the two reasons for which LC Oscillations is not realistic?

60. Differentiate between step up and step down transformer.

61. Define the turn ratio, voltage ratio and current ratio of a transformer.

62. An ideal inductor consumes no power in the circuit. Explain.

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63. Show that the average power dissipated depends not only on only on the voltage and current, but also on the cosine of the phase angle ϕ between them.

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64. Discuss grow and decay of current in L-R ckt?

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65. What is meant by mean value of a.c. Derive an expression for mean value of a.c. over first half cycle.

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66. Discuss parellel resonance circuit. Where is it used?

67. An ideal inductor consumes no power in the circuit. Explain.

68. In what situation it is preferable to use an a.c. over dc.?

69. A capacitor allows only a.c. to pass through. Why?

70. Calculate the phase difference between voltage and current when circuit contains only capacitor.

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71. Calculate the energy stored in a capacitor.

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72. With a diagram show that in pure resistor, the voltage and current are in phase. The minima, zero and maxima occurred at the same respective times.

73. An ac voltage is applied to a series of LCR circuit. Determine the instantaneous current i and its phase relationship to the applied alternating voltage v.

74. "Larger the value of Q, the smaller of the value of $2\Delta\omega$ or the bandwith and sharper is the resonance". Describe.

75. A resistor of 100Ω and a capacitor of $\frac{20}{\pi}\mu F$ are connected in series to a 230V, 50Hz ac source. Calculate the current in the circuit.

Also calculate the voltafge (rms) across the resistor and the capacitor.

76. Show that the LC oscillation is similar to the mechanical oscillation of a block attached to a spring.

77. What are the main two types of transformer.

78. A transformer is used to illuminate a bulvb (36 watt and 12v)_ with the help of 220V mains. If the efficiency of the transformer is 75%, then calculate the current in the primary coil.

79. Calculate the total resistance in L-C-R circuit by mathematical method.

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80. Calculate the phase difference between voltage and current at resonance in L-C-R circuit

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81. The instantaneous current from an a.c. source is given by $I = 5 \sin 314t$. What is the r.m.s value of the current.

82. The electric mains in house are marked 220V, 50 Hz. Write down the equation of instantaneous voltage.

83. A sinusoidal voltage $V = 200 \sin 314t$ is applied to a resistor of 10Ω. Calculate r.m.s value of voltage

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84. A sinusoidal voltage $V = 200 \sin 314t$ is applied to a resistor of 10Ω. Calculate r.m.s value of current.

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85. What should be the frequency of alternating 200V so as to pass maximum current of 9A through an inductance of 1 henry.

86. A $3\mu F$ capacitor is connected to a 220V, 50 Hz a.c. source. Calculate the r.m.s value of current through the ckt.

87. Obtain the resonance frequency of a series LCR circuit with L=2H. $C = 32\mu F$ and $R = 10\Omega$.What is the Q-value of this circuit.

88. An inductor 20 mH, a capacitor 50 μF and a resistor 40 Ω are connected in series across a source of emf V=10sin340t. Calculate the power loss in A.C. circuit