QUESTION BANK
ALTERNATE CURRENT
LEVEL A

1) Which value of current do you read with an AC ammeter? 1
2) When an alternating current is passed through a moving coil galvanometer, it shows no deflection why? 1
3) What is the principle of transformer? 1
4) Define rms value of AC. Give its mathematical expression. 1
5) Name the transformer if the no. of turns in secondary is more than the primary. 1
6) What is the relation of capacitive reactance? And write its unit. 1
7) What is the relation of Inductive reactance? And write its unit. 1
8) Write the relation for the power factor in an AC circuit. 1
9) In a transformer how the effect of eddy currents are reduced. 1
10) Write the relation for power loss in the form of heat when electric power is transported from one place to other place. 1
11) Show that when ac voltage is applied to a resistor the current is in phase with voltage 2
12) Show that the average power supply to an inductor over one complete cycle is zero 2
13) A light bulb is rated at 100 W for a220 V supply. Find (a) resistance of bulb (b) voltage of the source and (c) rms current through the bulb 2
14) A choke coil and a bulb are connected in series to a d. c. source. The bulb shines brightly. How does its brightness changes when an iron core is inserted in a choke coil? 2
15) Which device will you use to step up a.c. voltage? Can you use the same device to step up d.c. voltage? 2

16) A pure inductor is connected across an a.c. source. Show mathematically that the current in it lags behind the applied emf by a phase angle or $\pi/2$. What is its inductive reactance? Draw a graph showing the variation of inductive reactance with the frequency of the a.c. source. 3

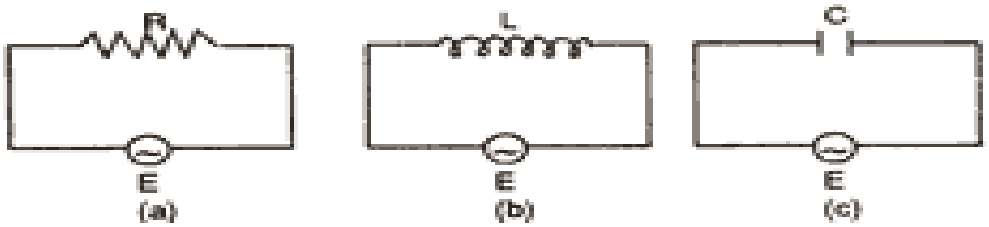
17) Write the principle and working of a transformer with the help of a diagram. 5

18) when an AC voltage is applied to a series LCR series circuit with help of Phasor diagram Deduce the relation for Impedance. And also draw impedance diagram. 5

LEVEL B

1) What is a choke coil? Why is it preferred to resistance in a.c. circuits? 2

2) In figures (a), (b) and (c) are shown three a.c. circuits with equal currents. If the frequency of e.m.f. be increased, then what will be the effect on the currents flowing in them? Explain with reason. 3



3) In a given circuit, inductor L and resistor R have identical resistance. Two similar electric lamps B 1 and B 2 are connected as shown. When switch S is closed, (i) which one of the lamps lights up earlier, (ii) will the lamps be equally bright after some time? Justify your answer. 3

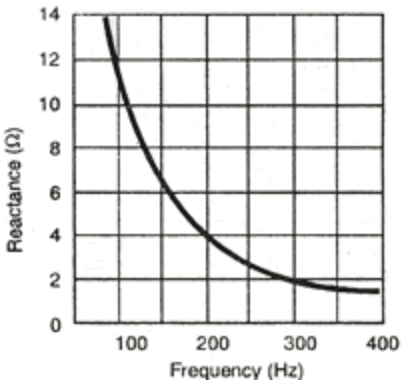
4) A pure inductor is connected across an a.c. source. Show mathematically that the current in it lags behind the applied emf by a phase angle or . What is its inductive reactance? Draw a graph showing the variation of inductive reactance with the frequency of the a.c. source. 3

5) A town situated 20 km away from a power plant generating power at 440 V, requires 600 kW of electric power at 200 V. The resistance of the two wire line carrying power is per km. The town gets power from the line through a 3000 - 220 V step down transformer at a substation in the town. 3

(i) Find the line power losses in the form of heat.

(ii) How much power must the plant supply, assuming there is negligible power loss due to leakage?

6) Using the given fig how the reactance of a capacitor varies with frequency?
(i) Use the information on graph to calculate the value of capacity of the capacitor.
(ii) An inductor of inductance 'L' has the same reactance as the capacitor at 10Hz. Find the value of L.
(iii) Using the same axes, draw a graph of reactance against frequency for the inductor given in part (ii).
(iv) If this capacitor and inductor were connected in series to a resistor of 10 ohm.What would he the impedance of the combination at 300 Hz? 5



7) A circular coil of N turns and radius R, is kept normal to a magnetic field, given by . Deduce an expression for e.m.f. induced in this coil. State the rule which helps to detect the direction of induced current. 3

8) Show diagrammatically two different arrangements used for winding the primary and secondary coils in a transformer.
Assuming the transformer to be an Ideal one, write expressions for the ratio of its
(i) Output voltage to input voltage
(ii) Output current to Input current
in terms of the number of turns in the primary and secondary coils. Mention two reasons for energy losses in an actual transformer. 3

9) The power factor of an AC. circuit is 0.5. What will be the phase difference between voltage and current in this circuit?
10) A series LCR circuit with L=0.12H, c=4.8*10 –7f, R=23Ω is connected to a variable frequency supply. At what frequency is the current maximum? 3

11) A power transmission line feed input power of 2300V to a step down transformer having 4000 turns in its primary. What should be the number of turns in the secondary to get output power at 230V? 3

12) A radio of frequency choke is air-cored coil whereas an audio frequency is iron-cored. Give reason for this difference.

2

13) The effective value of current in a 50 cycles a.c. current is 5.0A.what is the value of current 1/300S after it is zero? 3

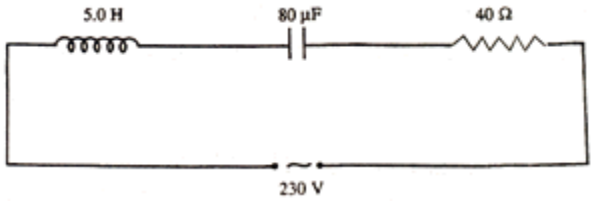
14) A rectangular coil of N turns area A is held in a uniform magnetic fold B. If the coil is rotated at a steady angular speed ω, deduce an expression for the induced e.m.f. in the coil at any instant of time. 3

15) A series LCR circuit with R=40ohm, L= 100mH and C=10 f is connected to a variable frequency of 200v A.C. supply when the frequency of the supply equals the natural frequency of the circuit, what is the average power transferred to the circuit in our complete cycle? 3

16) A 25 micro farad capacitor is connected to a 220V ,50 Hz AC. supply. Calculate the value of rms. current in the circuit. 3

17) An ideal inductor consumes no electric power in an a.c. circuit? Explain. 2

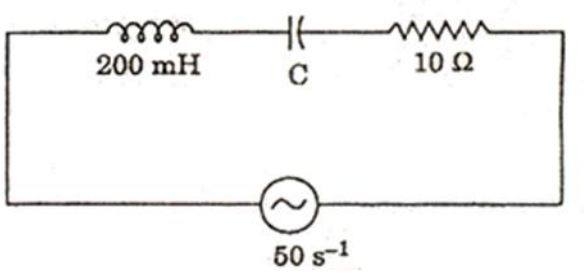
18.The given circuit diagram shows a series LCR circuit connected to a variable frequency 230 V source:



(a) Determine the source frequency which drives the circuit in resonance.
(b) Obtain the impedance of the circuit and the amplitude of current at the resonating frequency.
(c) Determine the rms potential drops across the three elements of the circuit.
(d) How do you explain the observation that the algebraic sum of the voltages across the three elements obtained in (c) is greater than the supplied voltage? 5

16) The primary coil of an ideal step-up transformer has 100 turns and the transformation ratio is also 100. The input voltage the power is 220 V and 1100 W respectively. Calculate:
(i) number of turns in the secondary
(ii) the current in the primary
(iii) voltage across the secondary
(iv) the current in the secondary
(v) power in the secondary 5

17) When an inductor L and a resistor R in series are connected across a 12 V, 50Hz supply, a current of 0.5 A flows in the circuit. The current differs in phase from applied voltage by radian. Calculate the value of R. 3



LEVEL C

1) A transformer having efficiency 90% is working on 100V and at 2.0KW power.If the current in the secondary coil is 5A,calculate (i) the current in the primary (ii) Voltage across the secondary coil. 3

2) Draw graphs showing variation for reactance of (i) a capaictor (ii) an inductor with frequency of the applied voltage? 2

3) Device an expression for the phase angle of an a.c. circuit with an inductor L, a capaictor and a resistor R in series .Draw the phase diagram & obtain an expression for the resonant frequency. 3

4).In a series R - C ciruit, radian second Find the current in the circuit and calculate the voltage across the resistor and the capacitor.
Is the algebraic sum of these voltages more than the source voltage? If yes, resolve the paradox. 3

5) When an inductor L and a resistor R in series are connected across a 12 V, 50Hz supply, a current of 0.5 A flows in the circuit. The current differs in phase from applied voltage by $\pi/3$ radian. Calculate the value of R. 3

6) In a series R - C ciruit, $R = 30\,\Omega, C = 0.25\,\mu F, V = 100\,V \text{ and } \omega = 10{,}000$ radian second Find the current in the circuit and calculate the voltage across the resistor and the capacitor.
Is the algebraic sum of these voltages more than the source voltage? If yes, resolve the paradox. 3

7) Show diagrammatically two different arrangements used for winding the primary and secondary coils in a transformer.
Assuming the transformer to be an Ideal one, write expressions for the ratio of its
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in terms of the number of turns in the primary and secondary coils. Mention two reasons for energy losses in an actual transformer. 5