SAINIK SCHOOL GOPALGANJ
CLASS – XII
ASSIGNMENT – ALTERNATING CURRENT

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

2. (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 thepeak current?

3. A 44 mH inductor is connected to 220 V, 50 Hz ac supply. Determinethe rms value of the current in the circuit.

4. A 60 μF capacitor is connected to a 110 V, 60 Hz ac supply. Determinethe rms value of the current in the circuit.

5. In question no. 3 and 4, what is the net power absorbed by eachcircuit over a complete cycle. Explain your answer.

6. Obtain the resonant frequency $\omega_r$of a series *LCR* circuit with$L$ = 2.0H, C = 32 μF and R = 10 Ω. What is the *Q*-value of this circuit?

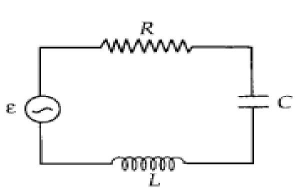
7. A charged 30 μF capacitor is connected to a 27 mH inductor. What isthe angular frequency of free oscillations of the circuit?

8. Suppose the initial charge on the capacitor in question 7 is 6 mC.What is the total energy stored in the circuit initially? What is thetotal energy at later time?

9. A series *LCR* circuit with R = 20 Ω, L = 1.5 H and C = 35 μF is connectedto a variable-frequency 200 V ac supply. When the frequency of thesupply equals the natural frequency of the circuit, what is the averagepower transferred to the circuit in one complete cycle?

10. A radio can tune over the frequency range of a portion of MWbroadcast band: (800 kHz to 1200 kHz). If its *LC* circuit has an effectiveinductance of 200 μH, what must be the range of its variablecapacitor?

11. Figure (i) shows a series *LCR* circuit connected to a variablefrequency 230 V source. L = 5.0 H, C = 80μF, R = 40 Ω.



Fig(i)

(a) Determine the source frequency which drives the circuit inresonance.

(b) Obtain the impedance of the circuit and the amplitude of currentat the resonating frequency.

(c) Determine the rms potential drops across the three elements ofthe circuit. Show that the potential drop across the *LC*combination is zero at the resonating frequency.

12. Show that in the free oscillations of an *LC* circuit, the sum of energies stored in the capacitor and the inductor is constantin time.

13. A sinusoidal voltage of peak value 283 V and frequency 50 Hz is applied to a series *LCR* circuit in which$R = 3\ \Omega$, $L = 25.48$ mH, and $C = 796\ \mu F$. Find

(a) the impedance of thecircuit;

(b) the phase difference between the voltage across the sourceand the current;

(c) the power dissipated in the circuit; and

(d) thepower factor.

14. (a) For circuits used for transporting electric power, a low power factor implies large power loss in transmission. Explain.

(b) Power factor can often be improved by the use of a capacitor ofappropriate capacitance in the circuit. Explain.

15. A resistor of 200 Ω and a capacitor of 15.0 μF are connected in series to a 220 V, 50 Hz ac source.

(a) Calculate thecurrent in the circuit;

(b) Calculate the voltage (rms) across theresistor and the capacitor. Is the algebraic sum of these voltagesmore than the source voltage? If yes, resolve the paradox.