Chapter 5

Application of DC and AC to passive components

One mark questions (Knowledge):

- 1. What is a transient period?
- 2. What is transient phenomenon?
- 3. Define time constant of RC circuit.
- 4. Define time constant of RL circuit.
- 5. What is a phase?
- 6. What is phase difference?
- 7. Write the unit of capacitive reactance.
- 8. What is inductive reactance?
- 9. Define average power.
- 10. Define reactive power.
- 11. Define apparent power.
- 12. Define power factor.
- 13. Define impedance.
- 14. What is the unit of impedance?
- 15. What is bandwidth?
- 16. What is low pass filter?
- 17. What is high pass filter?
- 18. Define quality factor.

One mark questions (Understanding):

- 1. What do you mean by transient response?
- 2. Give an expression for the voltage across capacitor during charging.
- 3. Give an expression for the voltage across capacitor during discharging.
- 4. Give an expression for the instantaneous current in RL circuit, during the growth of current.
- 5. Give an expression for the instantaneous current in RL circuit, during the decay of current.
- 6. Two AC quantities are in phase. What is the value of phase angle between them?
- 7. What do you understand by phase leading?
- 8. What do you understand by phase lagging?
- 9. Do you think resistance offered by the resistor is same for AC and DC?
- 10. Do you think resistance offered by the capacitor is same for AC and Dc?
- 11. Do you think resistance offered by the inductor is same for AC and Dc?
- 12. What do you mean by capacitive reactance?
- 13. Give an expression for the inductive reactance.
- 14. What do you mean by half power frequency?
- 15. How do you relate quality factor, bandwidth and resonance frequency?
- 16. Give an expression for the resonance frequency of a series resonance circuit.
- 17. Give the condition for the resonance of series RLC circuit.
- 18. Which expression do you use to calculate the impedance of series RLC circuit?
- 19. What is the phase difference between current and voltage in series RLC circuit?

20. What do you mean by filter?

One mark questions (Application):

- 1. Draw the phasor diagram of voltage and current in a purely resistive circuit.
- 2. Draw the phasor diagram of voltage and current in a purely capacitive circuit.
- 3. Draw the phasor diagram of voltage and current in a purely inductive circuit.
- 4. Draw the waveform of two in phase AC quantities.
- 5. Draw the waveform of two AC quantities that are 180[°] out of phase.
- 6. Sketch the phasor diagram of two AC quantities that are 90° out of phase.
- 7. Give the expression for phase angle between current and voltage in series RLC circuit?
- 8. Sketch frequency response curve of high-pass filter.

Two marks questions (Knowledge):

- 1. What is the frequency of DC? Name any one DC source.
- 2. Write expressions for instantaneous voltage and currents for an AC circuit containing pure capacitor.
- 3. Write expressions for instantaneous voltage and currents for an AC circuit containing pure inductor.
- 4. What is capacitive reactance and give the expression for the capacitive reactance.
- 5. Write a brief note on impedance of a circuit.

Two marks questions (Understanding):

- 1. What happen to the power for purely reactive circuit with voltage and current at 90[°] out of phase?
- 2. Describe the phenomenon of resonance in a series resonance circuit.
- 3. Define inductive reactance and give the expression for the inductive reactance.
- 4. Define capacitive reactance and give the expression for the capacitive reactance.
- 5. Derive an expression for resonance frequency of series resonance circuit.

Two marks questions (Applications):

- 1. Draw the graph showing voltage across capacitor during charging in CR circuit.
- 2. Draw the graph showing voltage across capacitor during discharging in CR circuit.
- 3. Draw the graph showing growth of current in RL circuit.
- 4. Determine the time constant of an RC circuit when R = 22 k Ω and C = 0.05 μ F.

Ans: τ = 1.1 mS

- 5. Determine the time constant of an RL circuit when R = 100 Ω and L = 100mH. Ans: τ = 1 mS
- 6. The time constant of an RL circuit is 4 mS, if L = 100 mH, calculate the value of resistance.

Ans: R = 25 Ω

7. The time constant of an RL circuit is 1 μ S, if R = 20 k Ω , calculate the value of inductance.

Ans: L = 20 mH

8. Draw the circuit diagram of low pass filter and high pass filter.

Three marks questions (Knowledge):

- 1. Write a note on AC applied to pure resistive circuit.
- 2. Write a note on AC applied to pure capacitive circuit.
- 3. Write a note on AC applied to pure inductive circuit.
- 4. What are the advantages of phasor diagram

Three marks questions (Understanding):

- 1. Discuss the charging of capacitor in RC circuit.
- 2. Discuss the discharging of capacitor in RC circuit.
- 3. Discuss the growth of current in RL circuit.
- 4. Discuss the decay of current in RL circuit.

Three marks questions (Application):

- 1. Determine the current through an inductor during the growth at t = 1 S in a DC circuit containing
R = 1 Ω and L = 1 H connected to DC supply of 20 V.Ans: 12.64 A
- 2. Determine the voltage across the capacitor and maximum current during charging at t = 1 S in a DC circuit containing R = 1 M Ω and C = 1 μ F connected to DC supply of 10 V.

Ans: V_c = 6.32 V, I_o = 10 μ A

3. What is the reactance of a 3 mH inductor connected to an AC of 200 V, 120 Hz?

Ans: 2.261 Ω

- 4. A 2.5 mH inductor is placed in a circuit, where the frequency is 100 kHz and voltage is 50 V. Calculate Inductive reactance and peak current? Ans: $X_L = 1570 \Omega$, $I_m = 31.84 \text{ mA}$
- 5. What is the capacitive reactance of a 0.01 μ F capacitor at 400 Hz? Ans: X_c = 39.8 k Ω
- 6. An inductor of 20 mH is connected in series with a resistor of 50 Ω . The combination is connected to 220 V, 50 Hz source. Find the current in the circuit. Ans: I = 4.36 A
- 7. A series RLC circuit has $R = 20 \Omega$, $C = 0.01 \mu$ F, L = 10 mH. Calculate resonant frequency.

Ans: $f_c = 15.9 \text{ k}\Omega$

Five marks questions (Application):

- 1. A coil of 100 mH having a resistance of 100 Ω is connected across a source of 200 V, 50 Hz. Find
the phase angle and current in the circuit.Ans: $\phi = 17.43^{\circ}$, I = 1.9A
- 2. A 10 Ω resistance in series with $X_L = 50 \Omega$ and $X_C = 25 \Omega$. The applied voltage is V = 50 mV with 50 Hz. Calculate Z, I and phase angle. Ans: $Z = 26.92 \Omega$, I = 1.85 mA, $\phi = 68.19^\circ$

Five marks questions (Knowledge):

- 1. Discuss charging and discharging of capacitor in a RC circuit.
- 2. Discuss the growth and decay of current in a RL circuit.

Five marks questions (Understanding):

- 1. Derive an expression for impedance in a series RLC circuit.
- 2. Explain low pass filter with its frequency response
- 3. Explain high pass filter with its frequency response
