CHAPTER – AC CIRCUITS

Theory:-

1. Define (a) form factor (b) peak factor. Obtain the rms value and average of half wave rectified sinusoidal voltage wave.
2. Discuss resonance in R-L-C series circuit. Explain how power factor, X_L and R vary with frequency.
3. Define power factor. What is the power factor of a pure inductor of a pure inductor? Give the difference between active and reactive power.
4. Define the following (a) Frequency (b) Phase and Phase difference (c) Time period (d) form factor (e) R.M.S. value (f) Average value.
5. Prove that in a purely capacitive circuit power consumed is zero when a.c. voltage is applied. Draw relevant phasor diagram and waveforms.
6. An inductive coil of resistance R and inductance L is connected in parallel with a capacitor of C. Derive an expression for resonant frequency and Q factor.
7. Explain the phenomenon of generation of Alternating voltages and currents and derive the expression for it with suitable diagrams.
8. Prove that power consumed by purely inductive or capacitive circuit is zero.
9. Prove that current in purely capacitive circuit leads its voltage by 90˚ and average power consumption in pure capacitor is zero.
10. Derive the relation between phase and line values of voltage and currents in case of 3-phase (a) star (b) delta connection.
11. Explain the method of measuring 3-Ø power by two watt meters.
12. Prove that power in a 3-phase balanced circuit can be deduced from the readings of two watt meters. Draw the relevant connection and phasor diagrams. Discuss the nature of power factor (a) when two readings are equal and positive (b) when two readings are equal but opposite in sign (c) when one wattmeter reads zero.

13. A balanced three phase supply is given to a star connected to load. Give proof of two wattmeter method for this system. State demerits of these methods.
14. Derive an expression for total power for a balanced 3 phase star OR delta connected load in terms of line voltage, line current and power factor.

Examples:-

1. Three currents are represented by I1 = 10 sin ωt; I2 = 20 sin (ωt-π/6); I3 = 30 sin (ωt + π/4). Find magnitude and phase angle of resultant current.
2. A certain waveform has a form factor of 1.2 and a peak factor of 1.5. If the maximum value is 100, find rms value and average value.
3. Two branches numbered '1' and '2' having impedances of 3+j4Ω and 3-j4Ω respectively are connected to a 230 volt, 50 Hz rms source. Find out:

   (a) The total current drawn from the source.
   (b) Power factor of that current.
   (c) Draw the phasor diagram for I1, I2 and total current and supply voltage.
4. A series RLC circuit is having resistance of 8, inductance of 80 mH and capacitance of 100 F is connected across 150 V, 50 Hz supply (as shown in figure). Calculate (a) the current, (b) the power factor and (c) the voltage drops in the coil and capacitance.

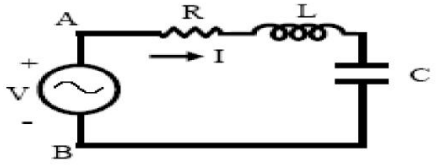

FIG 2

5. The circuit having two impedances Z1 = 8 + j15 and Z2 = 6 – j8 in parallel, is connected to a single phase as supply and current drawn is 10 A. Find each branch current, both in magnitude and phase also the supply voltage.