**Assignment 2 A.C. Circuits**

1. Define (i) form factor (ii) peak factor. Obtain the rms value and average value of half wave rectified sinusoidal voltage wave.
2. Three currents are represented by i1 = 10 sinωt; i2 = 20 sin(ωt – π/6); i3 = 30 sin(ωt + π/4).Find magnitude and phase angle of resultant current.
3. 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.
4. Discuss resonance in R-L-C series circuit. Explain how p.f., XL and R vary with frequency.
5. Define power factor. What is the power factor of a pure inductor? Give the difference between active and reactive power.
6. Prove that power in a 3-phase balanced circuit can be deduced from the readings of two wattmeters. Draw the relevant connection and phasor diagrams. Discuss the nature of power factor (i) when two readings are equal and positive (ii) when two readings are equal but opposite in sign (iii) when one wattmeter reads zero.
7. Three similar coils each of resistance 28Ω and inductance 0.7H are connected in (i) star (ii) delta. If the supply voltage is 230V, 50Hz, calculate the line current and total power absorbed.
8. Two branches numbered ‘1’ and ‘2’ having impedances of 3 + j4 Ω and 3 –j4 Ω respectively are connected to a 230 Volt, 50 Hz rms source. Find out: (i) the total current drawn from the source. (ii) Power factor of that current. (iii) Draw the phasor diagram for I1, I2, the total current and supply voltage.
9. Give the comparison of series resonance and parallel resonance.
10. Write down the line value and phase value relationship of voltages and currents in 3 phase star and delta connected systems.
11. The input power to a 3 phase load is measured by two wattmeter method. The ratio of the readings of the two wattmeters connected for 3 phase balanced load is 4:1 The load is inductive. Find the load power factor.
12. A series RLC circuit having resistance of 8 Ω, inductance of 80 mH and capacitance of 100 µF is connected across 150 V, 50 Hz supply. Calculate,(a) the current, (b) the power factor, and (c) the voltages drops in the coil and capacitance.
13. Define following terms in connection with A.C wave forms : (i) Frequency (ii) phase & phase difference (iii) Time Period (iv) form factor (v) R. M. S. Value (vi) Average Value.
14. The circuit, having two impedances of Z1= 8 + j15 Ω and Z2= 6 - j8 Ω in parallel, is connected to a single phase ac supply and the current drawn is 10 A. Find each branch current, both in magnitude and phase, and also the supply voltage.
15. Define the term (1) reactance, (2) inductive reactance and (3) capacitive reactance and explain how it depends on frequency in an A. C. circuit.
16. Derive an expression for the total power for a balanced 3 phase star or delta connected load in terms of line voltage line current and power factor.
17. Prove that in a purely capacitive circuit power consumed is zero when a.c. voltage is applied. Draw relevant phasor diagram and waveforms.
18. An alternating current varying sinusoidally with a frequency of 50 Hz has r.m.s. value of 10A. Write down the equation for instantaneous value and find this value (i) 0.0025 second and (ii) 0.0125 second after passing through a positive maximum value.
19. 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.
20. A resistor of 40Ω and an inductor of 0.2 H and capacitor of 120 µF are connected in parallel across 230V, 50 Hz supply. Find: (i) the current of each branch (ii) the resultant current (iii) power factor of the circuit.
21. Three identical coil each having resistance of 10 Ω and reactance of 10 Ω are connected in (i) star and (ii) delta across 400V, 3 phase supply. Find in each case line current and the reading of each of the two watt meters connected to measure the power.
22. Prove that average power consumption in pure inductor is zero when A.C. voltage is applied.
23. Derive the relation between line voltage and phase voltage, line current and phase current in star connection.
24. A choke coil is connected to DC supply of 220 V; the current drawn by the coil is 22 Amp. When the same coil is connected to an AC supply of 220 V, 50 Hz, the current is 10 A. Determine (i) Resistance (ii) Impedance (iii) Reactance (iv)Inductance of choke coil.
25. A series RLC circuit consists of a resistance of 500 Ω, inductance of 50 mH and a capacitance of 20 pF. Find (i) resonant frequency (ii) Q factor of the circuit (iii) half power frequencies.
26. Write advantages of 3-phase system over a single-phase system.
27. With neat circuit diagram and a phasor diagram, prove that, two wattmeters are sufficient to measure total power in 3-phase system.
28. An inductive circuit of resistance 2 Ω and inductance of 0.01 H is connected to a 250 V, 50 Hz supply. What is capacitance required to be placed in parallel with this circuit to produce resonance?
29. Two wattmeters are used for measuring three- phase power input to the motor. If readings of meters are 7 kW and 2 kW respectively, calculate input power and power factor of the motor.