35. What are the advantages of sinusoids?

The advantages of sinusoids are :

1. The machines and appliances working on sine wave vo ltage and currents have better performance characteristics than with other wave shapes
2. The rate of change of a sinusoidal quantity is smal l and hence does not induce large harmful EMFs in the associated circuits.
3. The derivatives and integrals of a sinusoid are als o sinusoids
4. The addition and multiplication of two sinusoids re sult in a sinusoid.

36. Define average value.

The average value of an alternating quantity is defined as that value which is obtained by averaging all the instantaneous values ove r a period of half cycle.

37. Define instantaneous value.

The value of an alternating quantity at a particular instant is known as instantaneous value. For example e_1 and e_2 are the instantaneous value of an alternating emf at instants t_1 and t_2 respectively.

38. Define cycle of an alternating quantity.

Each repetition of a set of positive and negative instantaneous values of the alternating quantity is called a cycle.

39. Define time period of an alternating quantity.

The time taken by an alternating quantity to complete its one cycle is known as its time period denoted by T. after every T seconds, the cycle of an alternating quantity repeats.

40. Define frequency of an alternating quantity.

The number of cycles completed by an alternating quantity per second is known as its frequency. It is denoted by f and is measured in cycles/second which is known as Hertz, denoted as Hz.

$$f = 1/T \text{ Hz}$$

41. Define peak value of an alternating quantity.

The maximum value attained by an alternating quantity during positive or negative half cycle is called its peak value. It is de noted as E_m or I_m.

Thus E_m is called peak value of the voltage while I_m is called peak value of the current.

42. Define RMS value or effective value of an alter nating quantity.

The Root Mean Square (RMS) value or effective value is defined as the steady current (D.C) which, when flowing through a given circuit for a given time, produces the same amount of heat as produced by the alternating current, which when flowing through the same circuit for the same time

43. Define peak factor.

The peak factor of any waveform is defined as the ratio of the peak value of the wave to the rms value of the wave.

Peak factor = maximum value / rms value

Peak factor = V_m / V_{rms}

44. Define form factor.

Form factor is defined as the ratio of rms value to the average value of the wave.

Form factor = rms value / average value

For a sinusoidal wave, form factor =

= 1.11

45. Define impedance and admittance.

The ratio of phasor voltage V to phasor current I is called impedance, Z.

Impedance (Z) = V / I

The reciprocal of impedance is called admittance, Y.

Admittance (Y) = 1 / Z (s) where s = $1\Omega^{-1}$ = 1 mho

46. **What are the different types of dependent or controlled sources?**

The different types of dependent or controlled sources are

(i) Voltage controlled voltage source (VCVS)

(ii)Current controlled voltage source (CCVS)

(iii) Voltage controlled current source (VCCS)

(iv) Current controlled current source(CCCS)

UNIT 5: THREE PHASE CIRCUIT ANALYSIS

1. What is phase sequence?

Phase sequence of a polyphase system in the order i n which the different phase quantities reach their maximum values.

2. What are the methods of connections of three phase windings?

The methods of connections of three phase wi ndings are
(i) Independent connection.
(ii) Star connection.
(iii) Delta connection.

3. What is line current and Phase current?

The current flowing in the line is called the line current.
The current flowing in the phase is called the phas e current

4. What is line voltage and phase voltage?

The voltage between any two lines is called line voltage.
The voltage between any line and the neutral point is called the phase voltage

5. Give the line and phase values in star connection.

The relation between line voltage and phase voltage in a star connection is

$$E_L = \sqrt{3}\, E_{ph}$$

The relation between line current and phase current in a star connection is

$$I_L = I_{ph}$$

6. Give the line and phase values in delta connection.

The relation between line voltage and phase voltag e in a delta connection is

$$E_L = E_{ph}$$

The relation between line current and phase current in a delta connection is

$$I_L = \sqrt{3}\, I_{ph}$$

7. Write few methods available for measuring power in a 3- phase load.

The few methods available for measuring power in a 3- phase load are
(i) One wattmeter method
(ii) Two wattmeter method

(iii) Three wattmeter method

8. List the methods used for power measurement with si ngle wattmeter.

The methods used for power measurement with single wattmeter are

(i) Potential lead shift method.

(ii) T-method.

(iii) Artificial neutral method.

(iv) Current transformer method.

9. List the methods used for un balanced star connected load.

The methods used for un balanced star connected load are

(i) Equivalent delta method.

(ii) Mesh method.

(iii) Neutral voltage displacement method.

10. Write the expression for power factor in a balanced three phase circuit.

The expression for power factor in a balanced three phase circuit is given by

Power factor = $\cos [\tan^{-1}(\sqrt{3} (w_2-w_1)/ (w_1+ w_2)]$

11. What are the advantages of three phase system?

(i) The generation and transmission of electrical power are more efficient.

(ii) The power transmission in a three phase circuit is constant rather than pulsating as in a single phase circuit.

(iii) Three phase motors start and run much better than single phase motors.

12. What is the power factor when two wattmeter reading s are equal in a two wattmeter method of power measurement?

Power factor =1

13. Write expression for total power in a three phase system.

$P_T = \sqrt{3}\ V_L I_L \cos\Phi$

14. Write the expression for calculating real, reactive and apparent power of a three phase system.

i) Real power $P = \sqrt{3}\, V_L I_L \cos\Phi$
ii) Reactive power $Q = \sqrt{3}\, V_L I_L \sin\Phi$
iii) Apparent power $S = \sqrt{3}\, V_L I_L$

15. How are the wattmeter readings equal in two wattmeter method at UPF? Establish the condition mathematically.

$W_1 = E_L I_L \cos(30^\circ - \Phi^\circ)$

$W_2 = E_L I_L \cos(30^\circ + \Phi^\circ)$

Since $\Phi = 0$ at Unity power factor, $W1 = W_2$

16. **In a 3-phase circuit, what do you mean by balanced load?**

When the loads in all the phases are identical it is called balanced load.

17. When is a 3-phase supply system called balanced supply system?

When all the 3-phase voltages are equal in magnitude and displaced by 120° in space, the supply system is called 3-phase balanced system.

18. **In two wattmeter method of 3-phase power measurement, one of the meters gave reading after reversal of its current coil connection. What do you infer from this?**

The power factor is definitely less than 0.5.

19. **In two wattmeter method, what do you infer about the power factor when one wattmeter shows zero reading?**

The power factor is definitely 0.5.

20. What will be the readings of the two wattmeter used for measurement of power in a three phase circuit at unity P.F?

$W_1 = (\sqrt{3}/2)\, E_L I_L$

$W_2 = (\sqrt{3}/2)\, E_L I_L$

i.e., Both wattmeter readings are equal to each other and each will read half the total power.

21. Compare balanced and unbalanced network.

Let the three _ phase circuit consist of loads Z_1, Z_2 and Z_3 . If all the loads are equal in magnitude and phase angle and connected to a balanced supply system, it is called a balanced network.

If all the loads are different, it is called unbalanced network, even when the supply system is balanced.

e.g., for balanced load $Z_1 = Z_2 = Z_3$

for unbalanced load $Z_1 \neq Z_2 \neq Z_3$

22. **How can a wattmeter be used to measure reactive power?**

In case of balanced three phase circuit, the reactive power can be determined by using one wattmeter. The current coil of the wattmeter is connected in one line and its pressure coil is connected across the other two lines

Let the reading of wattmeter be W_r.
Then the total reactive power = $\sqrt{3}\ W_r$

23. A three phase balanced star connected load has 400V line to line voltage and 10 amperes line current. Determine the line to neutral voltage and phase current.

Phase voltage = line voltage / $\sqrt{3}$ = 400 / $\sqrt{3}$ =231 volts
Phase current = line current = 10 amperes

********** ALL THE BEST**********