UNIT-II

1. What does hunting of synchronous motor mean?

When the load applied to the synchronous motor is suddenly increased or decreased, the rotor oscillates about its synchronous position with respect to the stator field. This action is called hunting.

2. What could be the reasons if a 3-phase synchronous motor fails to start?

It is usually due to the following reasons a. Voltage may be too low.

b. Too much starting load.

c. Open circuit in one phase or short circuit. d. Field excitation may be excessive

3. What is synchronous condenser?

An over-excited synchronous motor under no load ,used for the improvement of power factor is called as synchronous condenser because, like a capacitor it takes a leading current.

4. Write the applications of synchronous motor.

a. Used for power factor improvement in sub-stations and in industries. b. Used in industries for power applications.

c. Used for constant speed drives such as motor-generator set, pumps and compressors.

5. What is an inverted 'V' curve?

For a constant load, if the power factor is plotted against various values of field exciting current, the curve formed is inverted V Shape and called as inverted 'V' curve.

Also draw draws the graph.

6. A synchronous motor starts as usual but fails to develop its full torque. What could it be due to?

a. Exciter voltage may be too low.

b. Field spool may be reversed.

c. There may be either open-circuit or short-circuit in the field.

7. What are the two types of 3-phase induction motor?

a. Squirrel cage induction motor. b. Slip ring induction motor.

8. Write the two extra features of slip ring induction motors. a. Rotor is having 3-phase winding.

b. Extra resistance can be added in the rotor circuit by connecting through the help of three slip rings for improving the power factor, increasing Starting Torque, limiting the

starting current.

9. Can we add extra resistance in series with squirrel cage rotor? State the reason?

We cannot add extra resistance in series with the rotor because all the copper bars of the rotor are short circuited in both the sides by copper end rings to have a closed circuit.

10. Why an induction motor is called rotating transformer?

The rotor receives electrical power in exactly the same way as the secondary of a two winding transformer receiving its power from primary. That is why an induction motor can

be called as a rotating transformer i.e., in which primary winding is stationary but the secondary is free to rotate.

11. Why an induction motor will never run at its synchronous speed?

If it runs at synchronous speed then there would be no related speed between the two, hence no rotor emf, no rotor current so no rotor torques to maintain rotation. That is why the rotor runs at its synchronous speed.

12. Define SCR?

Short circuit ratio (SCR) is defined as the ratio of field current required to produce rated voltage on open-circuit to field current required to produce rated armature current with the

terminals shorted, while the machine runs at synchronous speed.

13. Why is open circuit charactertics called magnetic charactertic?

The OCC is called magnetic charactertic because it gives the variation of space component of flux in air gap and mmf / pole of magnetic circuit.

14. What are the losses determined from SCC?

i. Copper loss

ii. Mechanical loss

15. What are stray load losses?

Stray load loss is the sum of load core loss and loss due to the additional conductor resistance offered to the ac.

16. What is synchronizing?

The operation of connecting an alternator in parallel with another alternator or with common bus bars is known as synchronizing.

17. What is a synchroscope?

Synchroscope is an instrument, which shows the phase relationship of emf of the incoming alternator. It also indicates whether the incoming alternator is running slow or fast.

18. What is direct axis?

The mmf wave is height when it is aligned with the field pole axis called the direct axis or d

axis.

19. What is quadrature axis?

The permeance offered to a mmf wave is lower when it is oriented 90o

To the field pole axis called the quadrature axis or q axis.

20. What are the two curves required for POTIER method?

i. No load curve.

ii. Full load zero power factor curve called wattless load charactertic.

21. What are the three methods of determining voltage regulation?

i. Synchronous impedance method or EMF method. ii. The ampere-turn or MMF method.

iii. Zero power factor or potier method.

22. When does a synchronous motor get over excited?

If the field excitation of the motor is increased, the field flux will become strong and Eb will increase. As a result Eb will exceed V and the motor will be called an over excited motor.

23. Define pullout torque?

The pullout torque is the torque, beyond which the synchronous link between field poles and resultant flux wave is severed and the machine falls out-of-slip.

24. What is the main advantage of POTIER method?

The voltage regulation calculated by potier's method is quite accurate.

25. What is meant by the subtransient period?

The initial period of decay of the short circuit current is called the subtransient, in which the current decay is governed mainly by the damper winding constant.

26. What is fractional pitch winding?

When a winding is made with coil span less than full pitch, the winding is called as fractional pitch winding.

UNIT-2

Synchronous motor

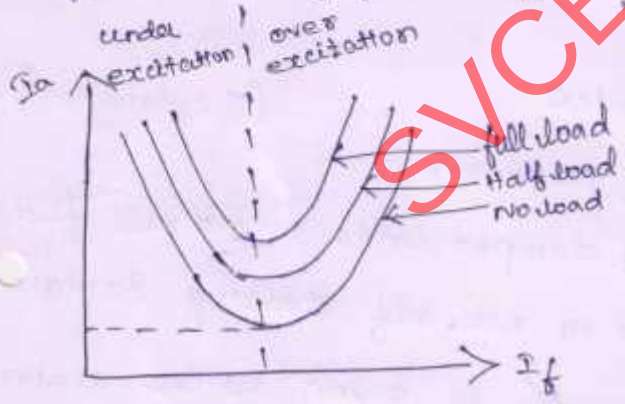
1) Explain the working of synchronous motor with different excitations?

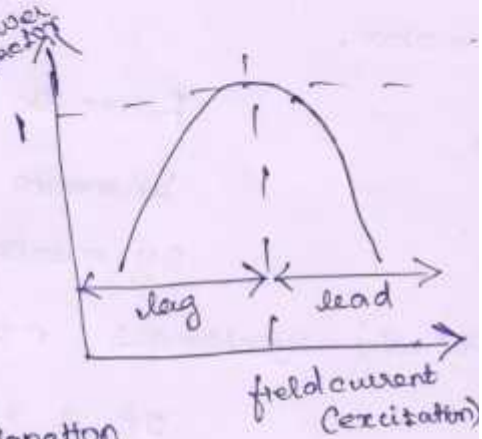
When a sinusoidal voltage is applied to a winding, the magnetic field produced by the resultant current flow will also be sinusoidally varying with respect to time. This means that the field is pulsating. Now when a 3ϕ voltage is applied to a 3ϕ winding, the flux produced will be the resultant of all the three pulsating fields.

$$N_s = \frac{120f}{P}$$

Diagram, explanation.

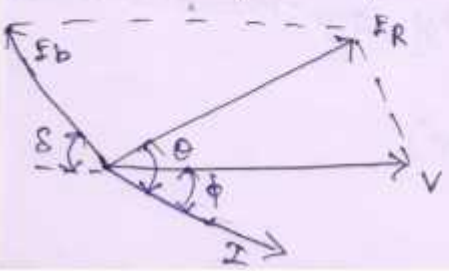
2. Explain the significance of V curve & inverted V curve.

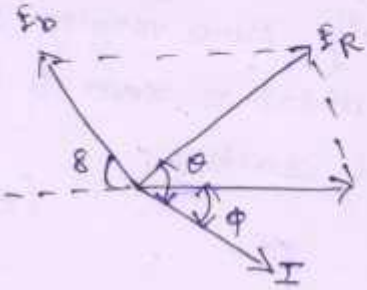




Diagram, explanation

3) Explain the effect changing excitation on armature current & power factor?





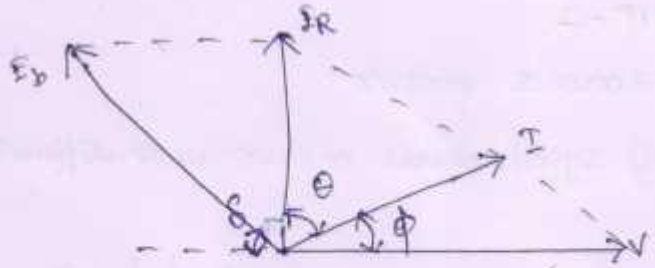


Diagram
Explanation

4) i) what are the various torques associated with Synchronous motor operation.

Starting torque
Running torque
pull in torque
pull out torque

(Explanation)

ii) Discuss various methods starting synchronous motor.

From DC source
By means of AC motor
By means of damper Grids in the pole faces.

(Explanation)

7. Why Synchronous motor is not self starting. Explain.

If a 3ϕ supply is given to the stator of a stationary synchronous machine with rotor excited, no steady starting torque will be developed. Instead, a sinusoidally time varying torque is developed, the average value of which is zero & that is why synchronous motor is not self starting.

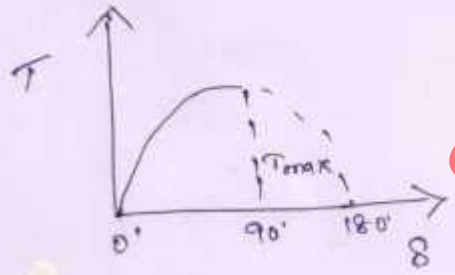
(Explanation)

8) Explain how synchronous motor can be used as a synchronous condenser.

Syn. condensers are sometimes operated at power factors ranging from lagging through unity to leading for voltage control. When operated in this way, a syn. condenser is called a synchronous phase modifier (or) phase advancer. (explanation, diagram)

An over excited syn. motor running on no load is known as syn. capacitor (or) syn. condenser.

9) Derive the expression for power developed in syn. motor. Also find the condition for max. power developed.



$$P_{mech} = \frac{E_b V}{X_s} \sin\delta$$

$$(P_{mech})_{max} = \frac{V^2}{4 R_a}$$

R_a = effective resistance