EE1251
ELECTRICAL MACHINES –II
TWO MARKS Q/A

Unit –I

1. **What do you mean by the salient-pole type rotor?**

Salient - pole type rotor means a low and moderate speed rotor having large diameter and small axial length with projected poles coming out of the rotor frame the outer surface of which almost follows the inner cylindrical surface of the stator frame.

2. **Define voltage regulation of an alternator:**

The voltage regulation of an alternator is defined as the increase in terminal voltage when full load is thrown off, assuming field current and speed remaining the same.

$$\text{Percentage regulation} = \frac{E_0 - V}{V} \times 100$$

E_0 = No load terminal voltage

V = Full load rated terminal voltage.

3. **What are the advantages of having rotating field system?**

1. Better insulation 2. Ease of current collection

3. Increased armature tooth strength. 4. More rigid construction

5. Reduced armature leakage reactance. 6. Lesser number of sliprings.

7. Lesser rotor weight & intertia 8. Improved ventilation & heat dissipation.

4. **Why is EMF method called Pessimistic method?**

The value of voltage regulation obtained by EMF method is always more than the actual value, therefore it is called Pessimistic method.

5. **Why is MMF method called Optimistic method?**

The value of voltage regulation obtained by MMF method is less than the actual value, therefore it is called Optimistic method.

6. **Compare salient pole rotor & smooth cylindrical rotor.**

Salient Pole Rotor	Cylindrical Rotor
1 Large diameter and short axial	1 . Small diameter and long axial length, length
2. Used for low speed alternators	2. Used for high - speed turboalternators
3.Has projecting poles	3. No projecting poles
4. Needs damper windings	4. Does not need damper windings.
5.Windage loss is more	5. Windage loss is less

7. **How is the armature winding in alternators different from those used in dc machines?**

The armature winding of the alternator is placed in the stator, but the in case of dc machines, armature winding is placed in rotor.

8. **What are the methods by using zero p.f. lagging curve can be obtained?**

Zero power factor characteristic of an alternator gives the variation of terminal voltage with field current, when the alternator is delivering its full rated current to a zero power factor (lagging) load. This characteristic is obtained by running the machine at synchronous speed and connecting a purely inductive 3phase load to its terminals. The load is varied in steps and at each step the field current is adjusted, so that the armature current is equal to its rated value.

9. **What are squirrel-cage windings of alternators? How and why are they used?**

Damper windings are squirrel cage windings of the alternators. This winding is placed in rotor pole shoes.

Unit- II

1. **What is hunting? How is hunting minimized?**

   When a synchronous motor is used for driving a fluctuating load, the rotor starts oscillating about its new position of equilibrium corresponding to the new load. This is called hunting or phase swinging.To prevent hunting, dampers (or) damping grids are employed. Damper windings are short circuited, copper bars are embedded in the faces of the field poles of the motor.

2. **When is a synchronous motor said to receive 100% excitation?**

   When $E_b = V$, synchronous motor receive 100% excitation.

3. **What is a synchronous capacitor?**

   An over excited synchronous motor, running without any mechanical load, used specifically for power factor correction is known as synchronous capacitor.

4. **When is a synchronous motor said to be under - excited? What will be the p.f at this condition?**

   Excitation emf E_b less than supply voltage $E_b < V$

   Lagging power factor.

5. **What are the inherent disadvantages of synchronous motor?**

   i) Higher cost

   ii) Necessity of a dc excitation source

   iii) Greater initial cost

   iv) High maintanence cost

6. **Mention four applications of synchronous motor?**

   i) Power factor correction

   ii) Constant speed, constant load drives

   iii) Voltage regulation of transmission lines.

7. **What is the role of synchronous motor in a transmission line? How?**

   Synchronous motor acts as a voltage regulator in a transmission line.

   When line voltage decreases due to inductive load, motor excitation is increased thereby increasing its power factor which compensates for the line voltage drop.

   When the line voltage increases due to line capacitive effect, synchronous motor excitation is decreased, thereby making its power factor lagging which helps to the maintain the transmission line voltage at its normal value.

8. **Enlist the advantages and disadvantages of synchronous motor.**

   Advantages of Synchronous Motors:

   1. The speed is constant and independent of load.
   2. These motors usually operate at higher efficiencies.
   3. Electro magnetic power varies linearly with the voltage.

4. These motors can be constructed with wider air gaps than induction motors, which make them better mechanically.
5. An Over excited synchronous motor having a leading power factor can be operated in parallel with induction motors.

Disadvantages of Synchronous Motor:

1. It cannot be started under load.
2. It requires dc excitation which must be supplied from external source.
3. It has a tendency to hunt.
4. It cannot be used for variable speed jobs as there is no possiblity of speed adjustment
5. Collector rings and brushes are required.

9. **Define pullout torque in synchronous motor:**

The maximum torque which the motor can develop without pulling out of step or synchronism is called the pull out torque.

10. **What is synchronous condenser?**

Synchronous motor is operating at an over excited condition is called synchronous condenser. The synchronous condensers having leading power factor are widely used for improving power factor of those power systems which employ a large number of induction motors and other lagging power factor loads.

11. **Define pull in torque in synchronous motor:**

It pertains to the ability of the machine to pull into synchronism when changing from induction to synchronous motor operation.

12. **What is meant by V curves of synchronous motor?**

The V-curves show the relation that exists between the armature curren: and field current for different constant power input.

13. **Give the expression for the gross mechanical power developed by synchronous motor.**

$$P_m = \frac{E_b V \sin \alpha}{x_s}$$

E_b = excitation emf,

V = Supply voltage,

x_s = synchronous reactance,

α = load angle.

14. **Name the important characteristics of a synchronous motor not found in an induction motor.**

The essential features of synchronous machine are f) The rotor speed is synchronous with stator rotating field, ii) The power factor can be easily varied by varying its field current, iii) It is used for constant speed operation.

15. **What is the common starting method used for synchronous motor?**

i) Starting with the help of damper winding.

ii) Starting with the help of separate small induction motor.

iii) Starting by using an ac motor coupled to the synchronous, motor

16. **Why does the synchronous motor always run at synchronous speed?**

A synchronous motor always runs at synchronous speed because of the magnetic locking between the stator and rotor poles.

UNIT-III

1.)What is the function of slip ring in 3 phase induction motor?

Slip rings are used to connect external stationary circuit to internal 2 M rotating circuit.

2.)Under what condition the slip in an induction motor is?

a)negative
b)greater than 1

a)When rotor is running at a speed above the synchronous speed slip is negative.
b)When motor is rotated in opposite direction to that of rotating field slip is greater than 1

3.)What are the 2 fundamental characteristics of a rotating magnetic field?

a)The resultant of three alternating fluxes separated from each other by 120 degree has constant amplitude of 1.5 .
b)The resultant always keeps on rotating with a certain speed in space.

4.)What is induction generator?

When the slip of the induction motor is negative the induction motor that runs as a generator is called induction generator.

5.)What are the purposes that could be served by external resistors connected in the rotor Circuit of phase wound induction motor?

a)increasing starting torque.
b)for speed control
c)limiting starting current.

6.)What are the merits of inner and outer cage of double cage induction motor?

Merits of inner cage—
a)leakage reactance is high.
b)resistance is small.
Merits of outer cage—
a)has high starting torque.
b)resistance is high.

7)Define Synchronous speed in a 3 phase I.M?

The speed at which the revolving flux rotates is called synchronous speed Ns and is given by

$$Ns = 120f / P$$

Where f – Supply Frequency
P- Number of poles on the ststor

8.)What are the types of induction motor?

a)split type induction motor.
b)capacitor start induction motor.
c)shaded pole induction motor.
d)deep bar rotor induction motors---etc.

9.)What are the losses in induction motor?

a)constant losses
b)variable losses.

10)What is crawling in I.M?

The tendency of the motor to run stably at speeds as low as one seventh of its synchronous speed with a low pitched howling sound is called crawling

11.)What are the applications of 3 phase I.M motors?

a)driving fans
b)blowers.
c)lathes
d)lifts---etc.

12.What are the characteristics of double squirrel cage motor, compared to a squirrel cage motor ?

(i) High starting torque
(ii) Excellent running performance

UNIT-IV

1.)How do you reverse the direction of rotation of 3 phase?

The direction of 3 phase can be reversed by interchanging any 2 terminals of 3 phase winding.

2.)What are the different speed control methods of squirrel cage induction motors?

a)supply frequency control
b)supply voltage control.
c)controlling number of stator poles.
d)adding rheostats in stator.

3.)What are the types of starters?

a)stator resistance starter
b)autotransformer starter.
c) star delta starter.
d) rotor resistance starter.
e) direct to line starter.

4.)How the stator poles can be changed?

a)consequent poles method.
b)multiple stator winding method.
c)pole amplitude modulation method.

5.)What is the effect of change in input voltage on starting torque of induction motor?

There is no change in starting torque due to change in input voltage. the motor reacts by drawing more current at lower speeds to keep the same torque.

6.)What are the definitions associated with stepping motor?

a)holding torque.
b)detent torque
c)step angle.
d)critical torque.
e)limiting torque.
f)slewing rate.

7.What is meant by Slip power recovery Scheme?

This slip power can be returned to the supply source and can be used to supply an additional motor which is mechanically coupled to the main motor. This type of drive is known as a slip power recovery system and improves the overall efficiency of the system.

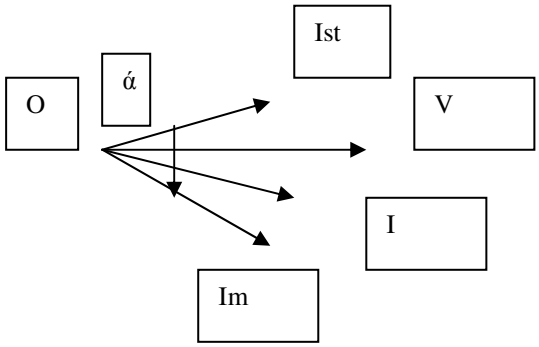
8.What are the various methods of speed control of 3 phase induction motor?

(i) stator voltage control
(ii) stator frequency control
(iii) V/f method
(iv) pole changing method

UNIT-V

1. What is the function of capacitor in a single phase induction motor ?

Capacitor is used to improve the power factor of the motor . Due to the capacitor connected in series with the auxiliary winding , the capacitive circuit draws a leading current which increases the split phase angle ά between two currents Im and Ist .



2**. What is the use of shading coil in the shaded pole motor ?**

In shaded pole motors the necessary phase –splitting is produced by induction. These motors have salient poles on stator and a squirrel cage type rotor . The poles are shaded ie each pole carries a copper band one of its unequally divided part is called shading band .

When single phase ac supply is given to the stator winding due to shading provided to the poles a rotating magnetic field is generated .

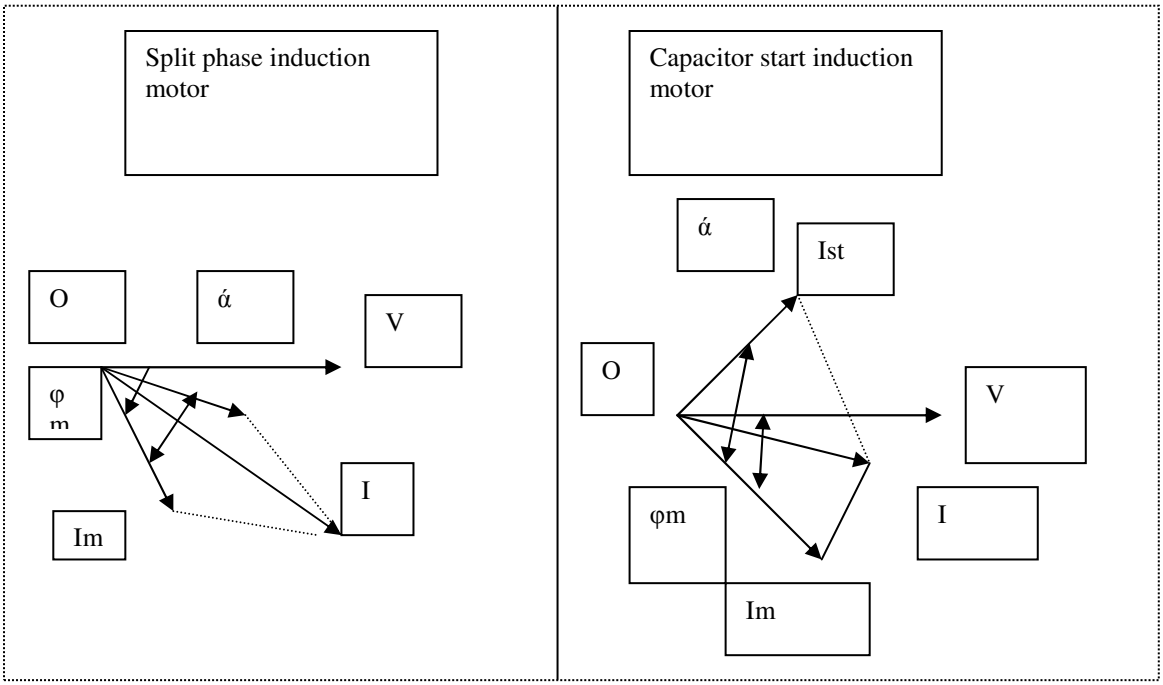
3 . **Why capacitor –start induction motors advantageous?**

In capacitor start induction motors capacitor is connected in series with the auxiliary winding . when speed of the motor approaches to 75 to80%of the synchronous speed the starting winding gets disconnected due to the operation of the centrifugal switch . the capacitor remains in the circuit only at start . the starting torque is proportional to phase angle ά and hence such motors produce very high starting torque.

4 . List out 4 applications of shaded pole induction motor ?

shaded pole motors have very low starting torque , low power factor and low efficiency. The motors are commonly used for small fans , toy motors ,advertising displays , film projectors , record players , gramophones ,hair dryers , photocopying machines etc

5. Draw the vector diagram for (a)capacitor start (b)split phase induction motor .



6. What are the drawbacks of the presence of the backward rotating field in a single phase induction motor?

Due to cutting of flux , emf gets induced in the rotor which circulates rotor current .the rotor current produces rotor flux . this flux interacts with forward component φf to produce a torque in one particular direction say anticlockwise direction . while rotor flux interacts with backward component φb to produce a torque in the clockwise direction . so if anti clock wise torque is positive then clockwise torque is negative thus net torque experienced by the rotor is zero at start .

7. Is single phase induction motor self starting ? why?

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8. Why is hysteresis motor free from mechanical and magnetic vibrations?

The stator of hysteresis motor carries main and auxiliary windings to produce rotating magnetic field or of shaded pole type also. The rotor is smooth cylindrical type made up of hard magnetic material . The torque in this motor is constant at all speeds it runs at synchronous speed . there is not relative motion between stator and rotor field so the torque due to eddy current vanishes .only hysteresis torque is present which keeps rotor running at synchronous speeds .the high retentivity ensures continuous magnetic locking between stator and rotor . Hence it is free from magnetic vibrations

9 . What types of motor is used in computer drives and wet grinders ?

For computer drives permanent magnet dc motors are used while in wet grinders universal motor may be used .

10. Give two advantages and two applications of stepper motor.

Advantages:

*These motors are compatible with digital equipments and are flexible in operation.

*The dynamic response is fast

Applications:

Stepper motors are widely used in computer peripherals such as serial printers tape drives , floppy disk drivers . they are also used in control of machine tools . robotics.

11. List some applications of linear induction motor?

They are used in machine tool industry and in robotics .They are used in trains operated on magnetic levitation , reciprocating compressors can also be driven by linear motors

12. What are the specific characteristic features of the repulsion motor?

repulsion motors give excellent performance characteristics. A very high starting torque of about 300 to350% of full load can be obtained with starting currents of about 3 to 4 times the full load current . thus it has got very good operating characteristics . the speed of the motor changes with load .with compensated type of repulsion motor the motor runs with improved power factor as the quadrature drop in the field winding is neutralised . also the leakage between armature and field is reduced which gives better regulation.

13. Discuss characteristics of single phase series motor

* To reduce the eddy current losses ,yoke and pole core construction is laminated

*The power factor can be improved by reducing the number of turns. But this reduces the field flux. But this reduction in flux increases the speed and reducing the torque. To keep the torque same it is necessary to increase the armature turns proportionately. This increases the armature inductance.

14. What are the demerits of repulsion motor?

*very expensive

*speed changes with load

* on no load speed is very high causing sparking at brushes

*low power factor on no load

15. List four applications of reluctance motors?

This motor is used in signalling devices ,control apparatus ,automatic regulators, recording instruments , clocks and all kinds of timing devices , teleprinters ,gramophones .16. What is a universal motor.

There are small capacity series motors which can be operated on dc supply or single phase ac supply of same voltage with similar characteristics called universal motors. The construction of this motor is similar to that of ac series motor