UNIT I

SYNCHRONOUS GENERATOR

PART-A

1. **What is an alternator?**

   An alternator or AC generator is a synchronous machine which converts mechanical energy into electrical energy and produces alternating emf.

2. **Why almost all large size Synchronous machines are constructed with rotating field system type?**

   The following are the principal advantages of the rotating field system type construction of Synchronous machines: The relatively small amount of power, about 2%, required for field system via slip rings and brushes. For the same air gap dimensions, which is normally decided by the kVA rating more space is available in the stator part of the machine for providing more insulation to the system of conductors, especially for machines rated for 11kV or above Insulation to stationary system of conductors is not subjected to mechanical stresses due to centrifugal action. Stationary system of conductors can easily be braced to prevent deformation. It is easy to provide cooling arrangement for a stationary system of conductors. Firm stationary connection between external circuit and system of conductors enable he machine to handle large amount of volt-ampere as high as 500MVA.

3. **Write down the equation for frequency of emf induced in an Alternator**.

   Frequency of emf induced in an Alternator, f, expressed in cycles per second or Hz, is given by the following equation F = (PN)/120 Hz, Where P-Number of poles N-Speed in rpm

4. **How are alternators classified?**

   According to type of field system

   Stationary field system type Rotating field system type

   According to shape of field system

   Salient pole type

   Smooth cylindrical type

5. **Name the types of Alternator based on their rotor construction.**

Alternators can be classified into the following two types according to its rotor construction

Smooth cylindrical type alternator

Salient pole alternator

6. **Why do cylindrical Alternators operate with steam turbines?**

Steam turbines are found to operate at fairly good efficiency only at high speeds.

The high speed operation of rotors tends to increase mechanical losses and so the rotors should have a smooth external surface. Hence, smooth cylindrical type rotors with less diameter and large axial length are used for Synchronous generators driven by steam turbines with either 2 or 4 poles.

7. **Which type of Synchronous generators are used in Hydro-electric plants and why?**

As the speed of operation is low for hydro turbines use din Hydro-electric plants, salient pole type Synchronous generators are used. These allow better ventilation and also have other advantages over smooth cylindrical type rotor.

8. **What are the advantages of salient pole type construction used for Synchronous machines**?

Advantages of salient-pole type construction are :

They allow better ventilation.The pole faces are so shaped that the radial air gap length increases from the pole center to the pole tips so that the flux distribution in the air-gap is sinusoidal in shape which will help the machine to generate sinusoidal emf Due to the variable reluctance the machine develops additional reluctance power which is independent of excitation

9. **Why is the stator core of Alternator laminated?**

The stator core of Alternator is laminated to reduce eddy current loss.

10. **How does electrical degree differ from mechanical degree**?

Mechanical degree is the unit for accounting the angle between two points based on their mechanical or physical placement. Electrical degree is used to account the angle between two points in rotating electrical machines. Since all

electrical machines operate with the help of magnetic fields, the electrical degree is accounted with reference to the magnetic field. 180 electrical degree is accounted as the angle between adjacent North and South poles.

11. What is the relation between electrical degree and mechanical degree?

The number of poles P, the electrical machine has, as given by the following equation

12. What is distributed winding?

When coil-sides belonging to each phase are housed or distributed in more than one slot under each pole region then the winding is called distributed winding. A full pitch coil has width of coil otherwise called coil-span as 180º - angle between adjacent slots in electrical degree and x= 1,2,3…

13. Why is short pitch winding preferred over full-pitch winding?

Advantages

Waveform of the emf can be approximately made to a sine wave and distorting harmonics can be reduced or totally eliminated.

Conductor material, copper , is saved in the back and front end connections due to less coil-span.

Fractional slot winding with fractional number of slots/phase can be used which in turn reduces the tooth ripples. Mechanical strength of the coil is increased.

14. Write down the formula for distribution factor.

m=number of slots/ pole/ phase

n = order of harmonic

15. Define winding factor.

The winding factor Kd is defined as the ratio of phasor addition of emf induced in all the coils belonging to each phase winding to their arithmetic addition.

16. Why are Alternators rated in kVA and not in kW?

The continuous power rating of any machine is generally defined as the power the machine or apparatus can deliver for a continuous period so that the

losses incurred in the machine gives rise to a steady temperature rise not exceeding the limit prescribed by the insulation class. Apart from the constant loss incurred in Alternators is the copper loss, occurring in the 3 –phase winding which depends on I2 R, the square of the current delivered by the generator. As the current is directly related to apparent – power delivered by the generator , the Alternators have only their apparent power in VA/kVA/MVA as their power rating.

17. What are the causes of changes in voltage in Alternators when loaded?

Variations in terminal voltage in Alternators on load condition are due to the following three causes:

Voltage variation due to the resistance of the winding, R Voltage variation due to the leakage reactance of the winding, Xt

18. What is meant by armature reaction in Alternators?

The interaction between flux set up by the current carrying armature and the main flux is defined as the armature reaction.

19. What do you mean by synchronous reactance?

Synchronous reactance X s= (Xl + Xa) The value of leakage reactance Xl is constant for a machine based on its construction. Xa depends on saturating condition of the machine. It is the addition of Xa , which represent the armature reaction effect between two synchronously acting magnetic fields that makes the total reactance Xa to be called synchronous reactance.

20. What is meant by synchronous impedance of an Alternator?

The complex addition of resistance, R and synchronous reactance , jXs can be represented together by a single complex impedance Zs called synchronous impedance.

In complex form Zs = (R + jXs)

In polar form Zs = | Zs | <

Where | Zs | = ¥_52 + X2 s)

21. Define the voltage regulation

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.

Percentage regulation = [Eo-V/V]x 100

22. What is a capability curve?

The limits within which the synchronous machines operate safely is called capability curves or operating charts.

23. What is meant by load angle of an Alternator?

The phase angle introduced between the induced emf phasor, E and terminal voltage phasor , U during the load condition of an Alternator is called load angle.

24. What is the speed range for which salient pole alternators are designed.

Speed range – 120rpm to 400rpm.

Applications – hydraulic turbines, diesel engines

PART-B

1. Explain the principle and construction of three phase alternator. Derive the EMF equation of an alternator.
2. Define voltage regulation. what are the methods of determining regulation of synchronous generator
3. Discuss the parallel operation of two alternators with identical speed / load characteristics
4. Explain briefly the two reaction theory. Elaborate the discussion on capability curve with its boundaries of synchronous machine.

UNIT II

SYNCHRONOUS MOTOR

1. **Name the various methods for predetermining the voltage regulation of 3-phase Alternator.**

The following are the three methods which are used to predetermine the voltage regulation of smooth cylindrical type Alternators

Synchronous impedance / EMF method

Ampere-turn / MMF method ,

Potier / ZPF method

2. **How synchronous impedance is calculated from OCC and SCC?**

Synchronous impedance is calculated from OCC and SCC as |Zs| = E0/Isc(for same If) A compromised value of Zs is normally estimated by taking the ratio of (E0/Isc) at normal field current Ifn. A normal field current Ifn is one which gives rated voltage Ur on open circuit. |Zs| = Ur/Iscn

3. **What are the advantages and disadvantages of estimating the voltage regulation of an Alternator by EMF method?**

Advantages:

Simple no load tests (for obtaining OCC and SCC) are to be conducted Calculation procedure is much simpler

Disadvantages:

The value of voltage regulation obtained by this method is always higher than the actual value

4. **Why is the synchronous impedance method of estimating voltage regulation considered as pessimistic method?**

Compared to other methods, the value of voltage regulation obtained by the synchronous impedance method is always higher than the actual value and therefore this method is called the pessimistic method.

5. In what way does the ampere-turn method differ from synchronous impedance method?

The ampere-turn /MMF method is the converse of the EMF method in the sense that instead of having the phasor addition of various voltage drops/EMFs, here the phasor addition of MMF required for the voltage drops are carried out. Further the effect of saturation is also taken care of.

6. What is the test data required for predetermining the voltage regulation of an Alternator by MMF method?

Data required for MMF method are:

Effective resistance per phase of the 3-phase winding R

Open circuit characteristic (OCC) at rated speed/frequency

Short circuit characteristic (SCC) at rated speed/frequency

7. Why is the MMF method of estimating the voltage regulation considered as the optimistic method?

Compared to the EMF method, MMF method, involves more number of complex calculation steps. Further the OCC is referred twice and SCC is referred once while predetermining the voltage regulation for each load condition. Reference of OCC takes care of saturation effect. As this method require more effort, the final result is very close to the actual value. Hence this method is called optimistic method.

8. State the condition to be satisfied before connecting two alternators in parallel

The following are the three conditions to be satisfied by synchronizing the additional Alternator with the existing one or the common bus-bars.

The terminal voltage magnitude of the incoming Alternator must be made equal to the existing Alternator or the bus-bar voltage magnitude.

The phase sequence of the incoming Alternator voltage must be similar to the bus bar voltage.

The frequency of the incoming Alternator voltage must be the same as the bus-bar voltage.

9. How do the synchronizing lamps indicate the correctness of phase sequence between existing and incoming Alternators?

The correctness of the phase sequence can be checked by looking at the three sets of lamps connected across the 3-pole of the synchronizing switch. If the lamps grow bright and dark in unison it is an indication of the correctness of the phase sequence. If on the other hand, they become bright and dark one after the other, connections to any two machine terminals have to be interchanged after shutting down the machine.

10. What are the advantages and disadvantages of three dark lamps method of synchronizing?

Advantages:

The synchronous switch using lamps is inexpensive Checking for correctness of the phase sequence can be obtained in a simple manner which is essential especially when the Alternator is connected for the first time or for fresh operation after disconnection.

Disadvantages:

The rate of flickering of the lamps only indicates the frequency difference between the bus-bar and the incoming Alternator. The frequency of the incoming Alternator in relation to the bus-bar frequency is not available.

11. How synchronoscope is used for synchronizing Alternators?

Synchronoscope can be used for permanently connected Alternators where the correctness of phase sequence is already checked by other means. Synchronoscope is capable of rotating in both directions. The rate of rotation of the pointer indicates the amount of frequency difference between the Alternators. The direction of rotation indicates whether incoming Alternator frequency is higher or lower than the existing Alternator. The TPST switch is closed to synchronize the incoming Alternator when the pointer faces the top thick line marking.

12. Why synchronous generators are to be constructed with more synchronous reactance and negligible resistance?

The presence of more resistance in the Synchronous generators will resist or oppose their synchronous operation. More reactance in the generators can

cause good reaction between the two and help the generators to remain in synchronism in spite of any disturbance occurring in any one of the generators.

13. List the factors that affect the load sharing in parallel operating generators?

The total active and reactive power delivered to the load, connected across the common bus-bars, are shared among Synchronous generators, operating in parallel, based on the following three factors

Prime-mover characteristic/input Excitation level and Percentage synchronous impedance and its R/X ratio

14. How does the change in prime mover input affect the load sharing?

An increase in prime-mover input to a particular generator causes the active power shared by it to increase and a corresponding decrease in active-power shared by other generators. The change in reactive power sharing is less appreciable. The frequency of the bus-bar voltage will also subjected to slight increase in value.

15. How does change in excitation affects the load sharing?

The decrease in excitation in one generator causes the reactive power shared by it to decrease and a corresponding increase in reactive-power shared by other generators. The change in active-power sharing is less appreciable. There will be a slight decrease in terminal voltage magnitude also.

16. What steps are to be taken before disconnecting one Alternator from parallel operation?

The following steps are to be taken before disconnecting one Alternator from parallel

Operation

The prime-mover input of the outgoing generator has to be decreased and that of other generators has to be increased and by this the entire active-power delivered by the outgoing generator is transferred to other generators.

The excitation of the outgoing generator has to be decreased and that of other generators have to be increased and by this the entire reactive-power delivered by the outgoing generator is transferred to other generators. After ensuring the current delivered by the outgoing generator is zero, it has to be disconnected from parallel operation.

17. What is meant by infinite bus-bars?

The source or supply lines with non-variable voltage and frequency are called infinite bus-bars. The source lines are said to have zero source impedance and infinite rotational inertia.

18. How does increase in excitation of the Alternator connected to infinite bus bars affect this operation?

Increase in excitation level of the synchronous generator will effectively increase the reactive component of the current supplied by the generator and hence the active power delivered.

19. Upon what factors does the load angle depend?

Angle is positive during generator operation and negative during motor operation.

20. An Alternator is found to have its terminal voltage on load condition more than that on no load. What is the nature of the load connected?

The nature of the load is of leading power factor , load consisting of resistance and capacitive reactance.

PART-B

1. Explain the operation of principle and working of synchronous motor with different excitations
2. Discuss the various methods of starting and procedure for starting synchronous motor.
3. Draw the equivalent circuit and phasor diagram of synchronous motor.
4. Discuss about the v curves and their construction. explain the significance of v and inverted v curves
5. Explain in detail about constant power lines, excitation circles and power circle of synchronous motor.

UNIT III

THREE PHASE INDUCTION MOTOR

1. **Name the tests to be conducted for predetermining the performance of 3-phase induction machine.**

   (a) No load test
   (b) Blocked rotor test

2. **How does the shaft torque differ from the torque developed in 3-phase Induction motor**?

   The mechanical power developed Pd causes the rotor to rotate at a speed Nr due to the torque Td developed in the rotor . Therefore, equation for Pr can be written as Pd __ 1rTd / 60 The remaining power, after the mechanical losses Wm are met with, available in the shaft as mechanical power output Po = Pd – Wm .The mechanical power output Po, which is less than Pd is available in the shaft running at a speed of Nr and with a shaft torque T. Therefore the shaft torque (T) is slightly less than the torque developed Td, Pd_ __ 1rT / 60 Wm = Pd – Po_ _>_ 1r(Td – T)] / 60

3. **What is circle diagram of an I M?**

   When an I M operates on constant voltage and constant frequency source, the loci of stator current phasor is found to fall on a circle. This circle diagram is used to predict the performance of the machine at different loading conditions as well as mode of operation.

4. **What are the advantages and disadvantages of circle diagram method of predetermining the performance of 3 –phase I M?**

   The prediction can be carried out when any of the following information is available The input line current., the input power factor, The active power input, The reactive power input, The apparent power input, The output power , The slip of operation, The torque developed, The equivalent rotor current per phase, Maximum output power, Maximum torque developed. The only disadvantage is, being a geometrical solution, errors made during measurements will affect the accuracy of the result.

5. **What are the advantages and disadvantages of direct load test for 3 –phase I M?**

   Advantages Direct measurement of input and output parameters yield accurate Results Aside from the usual performance other performances like mechanical Vibration, noise etc can be studied. By operating the motor at full

load for a continuous period, the final steady temperature can be measured. Disadvantages Testing involves large amount of power and the input energy and the entire energy delivered is wasted Loading arrangement cannot be provided for motors of large power rating

6. **In what way synchronous motor is different from other motors**?

All dc and ac motors work on the same principle. Synchronous motor operates due to magnetic locking taking place between stator and rotor magnetic fields.

7. **Name any two methods of starting a synchronous motors**

By an extra 3 phase cage induction motor

By providing damper winding in pole phases

By operating the pilot exciter as a dc motor

8. **What is the effect on speed if the load is increased on a 3 phase synchronous motor?**

The speed of operation remains constant from no load to maximum load in the motor operating at constant frequency bus bars.

9. **Why a synchronous motor is a constant speed motor**?

Synchronous motor work on the principle of force developed due to the magnetic attraction established between the rotating magnetic field and the main pole feed. Since the speed of rotating magnetic field is directly proportional to frequency the motor operates at constant speed.

10. **What is the phasor relation between induced emf and terminal voltage of a 3 phase Synchronous motor?**

The rotating magnetic field is initially established by the prime source of supply V. The main field then causes an emf e to get induced in the 3 phase winding. Hence when the machine operates as a synchronous motor the emf phasor always lags the terminal voltage phasor by the load/torque

11. **What are V and inverted V curves of synchronous motor**?

The variation of magnitude of line current with respect to the field current is called V curve . The variation of power factor with respect to the field current is called inverted V curve.

12. What happens when the field current of a synchronous motor is increased beyond the normal value at constant input?

Increase in emf causes the motor to have reactive current in the leading direction. The additional leading reactive current causes the magnitude of line current, accompanied by the decrease in power factor.

13. Distinguish between synchronous phase modifier and synchronous condenser

A synchronous motor used to change the power factor or power factor in the supply lines is called synchronous phase modifier. A synchronous motor operated at no load with over excitation condition to draw large leading reactive current and power is called a synchronous condenser.

14. How the synchronous motor can be used as s synchronous condenser?

Synchronous motor is operated on over excitation so as to draw leading reactive current and power from the supply lines. This compensates the lagging current and power requirement of the load making the system power factor to become unity. The motor does the job of capacitors and hence called as syn chronous condenser.

15. After servicing a single phase fan it was found to run in reverse direction. What could be the reason?

The connection to the starting/ auxiliary winding would have reversed.

16. What are the information obtained from blocked rotor test in a 3-phase I M?

(i)Blocked rotor input current per phase at normal voltage

(ii) Blocked rotor power factor and hence phase angle

(iii) Total resistance and leakage reactance per phase of the motor as referred to the stator.

17. State the characteristic features of synchronous motor.

a. the motor is not inherently self starting
b. The speed of operation is always in synchronous with the supply
c.frequency irrespective of load conditions
d..The motor is capable of operating at any power factor.

18. What type of single phase induction motor would you use for the following applications?

(i) Ceiling fan

(ii) Wet grinder Ceiling fan – capacitor start and run motor Wet grinder – capacitor start motor

19. What will be the direction of rotation of a shaded pole single phase induction motor?

The motor rotates in the direction specified by the un shaded to shaded region in the pole phase.

20. What are the information obtained from no-load test in a 3-phase I M?

(i) No –load input current per phase, Io

(ii) No load power factor and hence no load phase angle

(iii) Iron and mechanical losses together

(iv) Elements of equivalent circuit shunt branch

PART-B

1. Describe the principle of operation of a three phase induction motor.explain why the rotor is forced to rotate in the direction of rotating magnetic field
2. Derive the expression for torque, power and efficiency of induction motor
3. Draw the equivalent circuit and torque-slip characteristics of induction motor.
4. Explain the load test of induction motor.explain the construction of circle diagram of an induction motor
5. Write brief notes on [i] double cage rotor [ii] induction generator

UNIT IV

STARTING AND SPEED CONTROL OF THREE PHASE INDUCTION MOTOR

PART-A

1. **In what respect does a 1-phase Induction motor differ from a 3-phaseInduction motor**?

   Construction wise a plain 1-phase Induction motor is more or less similar to a 3-phase squirrel-cage Induction motor except that its stator is provided with only 1-phase winding.

2. **What are the inherent characteristics of plain 1-phase Induction motor**

   A plain 1-phase Induction motor is not used in practice due to the following inherent characteristics

   A plain 1-phase Induction motor does not have any starting torque However, if the rotor is initially given a starting torque, by some means, the motor can pick up its speed in a direction at which the initial torque is given and deliver the required output.

3. **Name the two different theories with which principle of 1-phase induction motors are explained.**

   The two different theories are

   Double revolving field theory

   Cross field theory

4. **State double revolving field theory.**

   Double revolving theory, formulated by Ferrari, states that a single pulsating synchronous speed proportional to the frequency of the pulsating field.

5. **Name any four types of 1-phase induction motors.**

   Based on the method of starting arrangement provided, the 1-phase Induction motors are classified as follows

   (i) Split-phase motor

(ii) Capacitor start motor

(iii) Capacitor start and run motor

(iv) Shaded pole motor

(v) Repulsion start Induction run motor

6. **State the principle of 3 phase IM?**

While starting, rotor conductors are stationary and they cut the revolving magnetic field and so an emf is induced in them by electromagnetic induction. This induced emf produces a current if the circuit is closed. This current opposes the cause by Lenz's law and hence the rotor starts revolving in the same direction as that of the magnetic field.

7. **How is the direction of a capacitor start Induction motor be reversed?**

The direction of rotation can be reversed by interchanging the terminals of either the main winding or the starting winding.

8. **Induction motor can run at synchronous speed ? True or false? Explain** .

No, if the speed of induction motor is Ns then the relative speed between the rotating flux and the rotor will be zero and so no torque is produced.

9. **An induction motor is generally analogous to** ?

It is analogous to a winding rotating transformer with its secondary circuit closed'.

10. **Can the starting torque of of a slip ring induction motor being increased?**

Yes. It can be increased by adding resistances to the rotor.

11. **What would happen if a 3 phase induction motor is switched on with one phase disconnected?**

The motor is likely to burn .

12. **What happens if the air gap flux density in an induction motor increases**?

The increase in air gap flux increases iron loss and hence efficiency decreases.

13. **State the advantages of skewing**?

It reduces humming and hence quite running of motor is achieved. It reduces magnetic locking of the stator and rotor.

14. State the condition at which the starting torque developed in a slip-ring induction motor is maximum.

When R2=X2

15. What are the effects of increasing rotor resistance on starting current and starting torque?

The additional external resistance reduces the rotor current and hence the current drawn from the supply. It improves the starting torque developed by improving the power factor in high proportion to the decrease in rotor current.

16. **What is slip of an induction motor**?

The slip speed expressed as the ratio of synchronous speed is defined as slip.

Percentage slip S=Ns-N/Ns*100

17. **How the magnitude of rotor emf is related to the slip in an I M?**

Rotor circuit emf per phase E2r=SE2

18. **How the frequency of rotor emf is related to the slip in an I M?**

Frequency of rotor emf/current fr=Sfs

19. **What is the normal value of slip of an I M operating at full load**?

3 - 5%

20. **Why is not possible for the rotor speed of an I M to be equal to the speed of its rotating magnetic field?**

The machine will not be able to develop any mechanical torque to run as a motor.

PART-B

1. Discuss the various starting methods of induction motors.
2. Explain the different speed control methods of squirrel cage induction motor.
3. Explain in detail the slip power recovery schemes
4. Describe the different types of slip power recovery scheme

UNIT-V

SINGLE PHASE INDUCTION MOTORS AND SPECIAL MACHINES

PART-A

1. **What are the principal advantages of rotating field type construction**?

Relatively small amount of power required for field system can easily supplied to rotating system using slip rings and brushes, more space is available in the stator part of the machine to provide more insulation, it is easy to provide cooling system, stationary system of conductors can easily be braced to prevent deformation.

2. **What are the advantages of salient type pole construction used in sync. machines?**

They allow better ventilation, the pole faces are so shaped radial air gap length increases from pole center to pole tips so flux distortion in air gap is sinusoidal so emf is also sinusoidal.

3. **Which type of sync Generators are used in hydroelectric plants and why**?

As the speed of operation is low, for hydro turbines used in hydroelectric plants, salient pole type sync. generator is used because it allows better ventilation also better than smooth cylindrical type rotor

4. **Why are alternators rated in KVA and not in KW**?

As load increases I^2R loss also increases, as the current is directly related to apparent power delivered by generator, the alternator has only their apparent power in VA/KVA/MVA as their power rating.

5. **Why the sync. impedance method of estimating voltage regulation is considered as pessimistic method?**

Compared to other method, the value of voltage regulation obtained by this method is always higher than the actual value so it is called as pessimistic method.

6. Why MMF method of estimating voltage regulation is considered as optimistic method?

Compared to EMF method, MMF method involves more no. of complex calculation steps. Further the OCC is referred twice and SCC is referred once while predetermining the voltage regulation for each load condition. Reference of OCC takes core saturation effect. As this method require more effort, final result is very close to actual value, hence this method is called as optimistic method.

7. Define voltage regulation of the alternator?

It is defined as the increase in terminal voltage when full load is thrown off, assuming field current and speed remaining the same.

% reg = [(E0 – V)/V]x100

Where E0 = no terminal voltage

V = full load rated terminal voltage

8. How is armature winding in alternators is different from those used in dc machines?

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

9. What is the advantage in using stepper motor?

1. it can drive open loop without feedback

2. it requires little or no maintenance.

10. What is hunting how can it be prevented?

When a sync 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 are damping grids are employed.

11. Define step angle?

It is defined as angle through which the stepper motor shaft rotates for each command pulse. It is denoted as β,

i)β=[(Ns-Nr)/ Ns.Nr]x360

Where Ns = no. of stator poles or stator teeth

Nr = no. of rotor poles or rotor teeth

ii) β = 360/mNr

Where m= no. of stator poles

12. What is different torques of a sync motor?

1. Starting torque
2. Running torque
3. Pull-in torque
4. Pull-out torque

13. What are the adv. of reluctance m/c?

1. Motor speed is constant 2. Simple construction

14. What are different types of stepper motor?

1. Variable reluctance (VR) motor
2. Permanent magnet (PM) stepper motor
3. Hybrid stepper motor

15. Give the applications of stepper motor?

1. Robotics
2. Computer peripherals
3. Facsimile machine
4. Aerospace.

16. Mention an ac motor which is used in servo applications.

AC servo motor

17. What is universal motor

A universal motor is specially designed series wound motor, that operates at approximately the same speed and output on either dc r ac of approximately same voltage

18. What is the general speed of universal motors?

20000rpm

19. Which direction direction does a shaded pole motor run?

Shaded pole motor rotates in a direction from the unshaded part of the pole to the shaded part.

20. What is reluctance motor?

It is single phase synchronous motor which does not require d.c excitation to the rotor. It is also known as synchronous reluctance motor.

PART-B

1. Describe the constructions of single phase induction motor.
2. Explain the double revolving field theory.
3. Explain the construction and principle of universal and ac series motor.
4. Explain the construction and principle of hystersis and repulsion motor
5. What is the stepper motor? describe anyone type of stepper motor
6. What are the types of single phase induction motor?
7. Write short notes on reluctance motor.