UNIT – 1

SYNCHRONOUS RELUCTANCE MOTORS

2- MARKS

1. **Write the torque equation of the SynRM?(Nov-14,May-14)**

$T=(3/Ws)Vs^2((Xsd-Xsq)/(2XsdXsq))\sin 2\delta$

Where, Te -developed torque of SynRM.

Xsd - direct axis

Xsq - quadrature axis

δ- Torque angle

Ws - synchronous speed

2. **What is meant by reluctance torque in SynRM?**

In a SynRM, the torque which is produced at critical speed due to the tendency of the salient rotor pole to align themselves with synchronously rotating field produced by the stator is known as reluctance torque.

3. **List the application of SynRM?(May-15,16,Nov-16)**

(or)

Give some potential application of SynRM?

- Fiber spinning mills
- Industrial process equipment
- Metering pumps
- Wrapping
- Folding machines

4. **State the principle and operation of SynRM?**

It is the motor driven by reluctance torque which is produced due to tendency of the salient rotor poles to align themselves with synchronously rotating field produced by stator. In this motor, the magnets are left out of the rotor, (or) they are demagnetized. The rotor of the SynRM has salient poles but neither have field windings nor permanent magnets.

5. **Write the different types of controllers used for SynRM?(Dec-2014)**

- Unipolar current controller.
- Bipolar current controller.

6. **Express the voltage and torque equation of SynRM? (Dec-2014)**

$Vds = \gamma_s i_{ds} + P\lambda\, ds + \omega_s Xqs$

$T = 3/w_s\, v^2(Xsd-Xsq/2XsdXsq)\sin 2\delta$ syn. watt

7. **What are the SYNREL motors?(Nov-2013)**
   - It is the motor driven by reluctance torque which is produced due to tendency of the salient rotor poles to align themselves with synchronously rotating field produced by stator.
   - In this motor the magnets are left out the rotor (or) they are demagnetized.
   - The rotor of a SynRM has salient poles but neither have field windings nor permanent magnet.

8. **List the types of SynRM.(May-2013,14)**

Types of SynRM:

- Line start SynRM. (cage type)
- Cage less PM/SynR hybrid motor.
- Brushless SynRM.

Depending upon the rotor construction the SynRM is two types:

- Radial air gap motor.
- Axial air gap motor

9. **Compare SynRM and induction motor. (Nov /Dec- 2015)**

SynRM	**Induction motor**
• Better efficiency. • High cost. • Low power factor. • Low and medium power application.	• Efficiency is low compared with SynRM. • Low cost. • High power factor. • High power application.

10. **Give the difference between SynRM and switched reluctance motor. (May-2013,2012)**

SynRM	Switched reluctance motor
• The motor has some no. of poles on stator and rotor. • Stator of SynRM is cylindrical type with distributed winding. • Stator has smooth bore except for slotting.	• The rotor of this motor has lesser poles then the stator due to self-starting capability. • Stator of SynRM is salient pole type with concentrated coils like DC machine. • In SRM, both stator and rotor have salient poles.

11. Write the various design parameter of SynRM. (Nov-2012)

- Segmental
- Radial
- Axial

12. What are the types of stator in vernier motor.

- **S**plit pole type
- Open slot type

13.**What are the merits of 3- phase, brushless PM Syn. Motors. (Nov/Dec- 2013)**

- The PM Syn. Motor has higher due to the elimination of brushes, slip rings & field copper losses.
- It has superior power density.
- High torque to inertia ratio is its additional merit.
- Normally, for small drives applications, the PM Syn. Motor is quite advantages then other AC motors.

14.State any four advantage of synchronous reluctance motor.

- It can operate from essential standard PWM ac inverters.
- Lower torque ripple.
- Simple and rugged construction.
- It has high speed capability.

15`Define torque angle.

In reluctance type synchronous motor when load is increased lightly the rotor momentarily slows down causing the salient poles of rotor to lag the rotating field .This angle of lag is called torque angle.

16`**Write down the important features of vernier motor**

- High torque to inertia ratio
- High torque at low speed
- The stator has uniformly pitched teeth on its surface towards the air gap
- The air gap permeance is distribution is a displaced triangular wave.

17.What are the factors to be considered while designing a vernier motor

The air gap permeance wave should have the same number of poles as the stator mmf wave

The number of stator and rotor slots should be such that N1=N2+P

Where p=number of poles of the rotating magnetic field.

18.What are the applications of vernier motor

- Direct drive application
- Application which required high torque at low speed.

19.What is synchronous reluctance motor.

It is the motor driven by reluctance torque which is produced due to tendency of the salient rotor poles to align themselves synchronously rotating field produced by stator.

20.What is vernier motor?

A vernier motor is an unexcited reluctance type synchronous motor which has the feature of high torque speed at low speed.The features is based on the principles of vernier or magnetic gearing effect such that a small displacement of the axes of maximum and minimum permeance.

PART-B (13- MARK)

1. Discuss in detail, about the construction and working principle of SynRM with phasor diagram? (13)
2. Explain the torque speed characteristics of SynRM in detail.
3. Differentiate between axial and radial air gap SynRM compare the performance of SynRM with switched RM?
4. Explain the working of variable reluctance type and hybrid type SynRM?
5. Discuss the construction, working and characteristics of linear induction motor?
6. Constructional feature of axial and radial flux SynRM.

7. Various stator current modes in SynRM.

UNIT-2

STEPPER MOTORS

2-MARKS

1. What is hybrid motor?

The stepper motor is defined as a motor which can be operated on both AC supply and DC supply at approximately the same speed and output.

2. List out different modes of excitation of stepper motors

- 1-Phase on mode
- 2-Phase on mode
- Half step operation
- Microstepping operation

3. What is holding torque in stepper motors?

It is defined as the maximum static torque that can be applied to the shaft of an excited motor without causing continuous rotation.

4. Define the term microstepping?

The mode of operation of the variable reluctance stepper motor in which the step angle is very small is known as microstepping.It is also called as mini stepping.It can be achieved by utilizing two phases simultaneously as in 2-phase on mode but here the two currents are deliberately made unequal.Microstepping provides smooth low speed operation and high resolution.

5. What is the function of drive circuits in stepper motor?

Drive circuits are usually used to regulate current flowing through a circuit and also the other factor.Current flowing through a circuit and also the other factor.The often used term is specialized integrated circuit that control high power switches or a constant voltage circuit that operating within a broad range of input voltage.

6. Define step angle in stepper motor?

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

7. Write the features of stepper motor which are responsible for its wide spread use?

- When definite number of pulses are applied to the motor,the rotor rotatesthrough definite known angle.This feature makes the stepper motor well suited for open loop position control.
- Since the nature of command is in the form of pulses,stepping motors are compatible with modern digital equipment.

8. Write the principle of operation of variable reluctance motor?

The stepper motor in which the reluctance of the magnetic circuit formed by the rotor and stator teeth varies with the angular position of the rotor is known as variable reluctance stepper motor.The direction of rotation of the variable reluctance stepper motor is independent of the polarity of the stator current.

9. Define Detent torque:

Detent torque is the maximum static torquethat can be applied to the shaft of an unexcited motor without causing a continuous rotation.

10. Name the various drivers circuits used in stepper motor?

- Resistance drives(1/R)
- Dual voltage drive (or) bi-level drive
- Chopper drive

11. Define lead angle.

- The angle of difference between the phase to be deenergised to bring the stepper motor to the position of equilibrium and energization of next phase winding to start the motor during closed loop operation is known as lead angle
- The relation between the rotor's present position and the phase to be excited is specified in terms of lead angle.

12. distinguish the half step and full step operation of a stepping motor

Full step	Half step
The motor moves through its basic step angle that is a 1.8^0 stepper motor takes 200 steps per motor revolution.	Excitation is alternating single and dual phase operation resulting in step that are half the basic step angle.

13. What is the need of suppressor circuits in stepper motor?

The suppressor are the circuits needed to ensure fast decay of current through the stepper motor winding,when it is turned off. Otherwise,high voltage spike will buildup which will damage the power semiconductor device associated with the power drive circuit.

14.Give the classification of stepper motor.

1)Variable reluctance steeper motor.

- Single stack
- Multi stack

2)Permanent magnet synchronous motor

- Hybrid stepper motor,
- Claw pole motor

15. Compare single stack multi stack configuration in stepping motors.

Single stack motor:

Stator is single stack of steel lamination winding would wound around poles stator and rotor poles may be different rotating step angle is 30 degree.

Multi stack motor:

It is divided along its axis into a number of stacks each enegized by separate phase.Number of stacks and phases will be 3 to 7. Stator and rotor poles are equal the rotating step angle is ten degree.

16. Write the factors of stepper motor which are responsible for its wide spread use?

a). When definite numbers of pulses of applied to the motor the rotor rotates through definite known angle.

b). Control of stepper motor is simple because neither a position or a speed sensor nor feedback loops are required for stepper motor to make the output response to follow the input command.

17.What are the advantage of stepper motor.

It can driven open loop without feed back

It is mechanically simple

It requires little or no maintenance.

18. What are the disadvantages of stepper motor?

Fixed step angle.

Limited power output and sizes available.

Limited ability to handle large inertia load

Low efficiency with ordinary control.

19.Define torque constant of a stepper motor.

It is defined as initial slope of the torque current curve of the stepper motor, it is also called as torque sensitivity.

20.State some application of stepper motor?

Floppy disk drives, quartz watches,camera shutter operation,dot matrix and line printers, machine tool applications.

PART-B

13-marks

1. Explain briefly about the constructional features of VR stepper motor. (May-2012) (Nov-2012-13) (8 marks)
2. Explain the principle of operation of hybrid stepper motor in detail. (May 2012) (Nov-14, 15) (8 mark)
3. Draw the schematic of DM stepper motor& explain the construction and principle of operation in detail discuss the characteristics &drive circuit for the above. (May 2012) (May 2014) (16 marks)
4. What is the stepping angle? calculate the stepping angle for a 3phase 24 poles pm type stepper motor.(Nov- 2012,13)(8 mark)
5. Describe the role of suppressors in drive circuit of stepping motor? Explain the different types of suppressor with neat diagram.(Nov -2012) (16 marks)
6. With a neat block diagram explain the microprocessor control of stepping motor. (May -2013, 15)
7. Explain the working of single stack &multi stack configured stepping motor. (May -13 , 16)
8. Describe the reluctance torque of stepper motor. (Nov -13)
9. Write the advantages of closed loop control of stepper motor. (Nov -15)
10. Explain about the dynamic and static characteristics of stepper motor. (May -16,Nov-16)
11. Explain about the modes of excitation.(Nov-16)
12. A stepper motor has resolution of 180 steps/rer. Find the pulse rate required in order to obtain a rotor speed of 2400 rpm. (Nov-16)
13. Draw and explain the drive circuits and their performance characteristics for stepper motor.
14. Describe the operation of VR type stepper motor with different modes of operation.

UNIT-3

SWITCHED RELUCTANCE MOTOR

2-MARKS

1. How will you achieve torque ripple minimization in SR motors?

These unique advantages of SRM are counteracted by the presence of torque ripple, high acoustic noise, need for rotor position information and complex control due to nonlinearbehavior. The main reasons for origin of torque ripple are the doubly salient structure and discrete nature of torque generation by phases in the motor minimization of

torque ripple can be achieved by improving the magnetic design of the motor and by using sophisticated electronic control techniques.

2. List out the limitations of SR motors?

- Less efficiency
- Poor power factor
- Need of very low inertia rotor.
- Less capacity to drive the loads

3. What is the working principle of SRM?

The SRM develops an electromagnetic torque due to variable reluctance Principle. Whenair gap is minimum, the reluctance will be minimum; hence inductance will be minimum, so the rate of change of inductance is zero. When the reluctance varies, there will be a change in inductance. So, when a particular stator winding of SRM is excited, the rotor pole comes in alignment with stator pole and thus the rotor rotates.

4. List out any four advantages of SRM?

- Simple & robust construction.
- It is self-starting
- Since the rotor carries no windings, no brushes, the SRM requires less maintenance.
- The ventilation system for SRM is easier as, more losses are taking place in the stator itself.
- Extremely high speeds are possible in SRM.

5. Write the torque equation of SRM?

In SRM, the torque is developed due to variable inductance principle and expressed as,

$T = 1/2\ (i^2(\partial L/\partial \Theta)Nm)$

I= phase winding current.

$\partial L/\partial \Theta$ = change in instantaneous with respect to change in rotor position.

Where it is independent of direction of current.

6. Mention some position sensors used in SRM?

- Phototransistors and photodiodes.
- Hall elements
- Magnetic sensors
- Pulse encoders
- Variable differential transformers.

7. What is the significance of closed loop control in SRM?

- The torque produced in one phase for motoring and regeneration.

- An average torque will result due to the combined instantaneous values of torque pulses of machine phases.
- The average torque is controlled by adjust the magnitude of winding current I_P or by varying the dwell angle Θ_d.

8. Enumerate the different power controllers used for the control of SRM?

- Power controller using two power semiconductor switching devices and two diodes per phase.
- Power controller using (n+1) power switching devices and (n+1) diodes for n-phase motor.
- Power controller using c-dump circuit.

9. What are the different modes of operation of SRM?

There are two modes of operation,

- Low speed operation mode.
- High speed operation mode.

10. What is the need of rotor positioning sensor in SRM?

The motor shaft of SRM carries a rotor position sensor that gives the information about the position the sensor with reference to the reference axis to the controller.

The controller compares this information from the rotor position sensor with the reference speed signal and then suitability turns on and off the concerned power semiconductor device of the switching circuit such that the desired phase winding is connected to the dc supply

11. Mention the applications of micro stepping VR stepper motor?

Microstepping is mainly used where very fine resolution is required. The applications are printing and photo type setting. AVR stepper motor with the micro stepping provides very smooth low-speed operation and high resolution.

12. List out the advantages and disadvantages of the converter circuit with two power semiconductor devices and two diodes per phase?

ADVANTAGES:

- The switching losses of the converter is reduced, since the switching frequency is reduced because of the presence of freewheeling.
- Control of each phase is independent of the other phases.

DISADVANTAGES:

- High number of switching devices are required in each phase which makes the converted circuit expensive

13. State the reluctance principle?

Stator and rotor poles tend to align in a minimum reluctance path. This is called minimum reluctance principle.

Air gap αreluctance α 1/inductance

14. List the characteristics of SRM?

- Low inertia and simple manufacturing.
- Losses appear only on the stator and easy to cool.
- No magnets and so permissible rotor temperature is higher than in PM motors.
- High starting torque, extremely high speeds possible.

15.List out advantages of switched reluctance motor.

- Constructions is very simple.
- Rotor carries no winding.
- No brushes and requires less maintenance.
- It is self starting machine.

16.Why SRM machine popular in adjustable speed drives?

- Construction is simple and robust
- There is no permanent magnet
- Rotor carries no winding ,no slip rings ,no brushes,less maintenance.

17.Difference between VR stepper motor with SR motor?

1) SR motor acts like brushless dc motor with rotor position feedback, but the stepper motor is usually fed with a square without rotor position feedback.

2)SR motor is designed for efficient power conversion of high speed comparable with those of the PM brushless dc motor.The stepper motor is usually designed as a torque motor with a limited speed range.

18)What is meant by effectiveness in SRM.

In SRM the energy stored in the magnetic it not necessary dissipated.With the appropriate convertor circuit it can be recovered to the supply at the end period of raising inductance hence the term effectiveness used instant of efficiency.

19.List out disadvantage of a switched reluctance motor?

- Stator phase winding should be capable of carrying magnetized current.
- For high speed operation developed torque as undesirable ripples is a result develop undesirable noises.
- It requires a position sensors.

20. What is the phase winding?

Stator poles carrying field coils.The field coils are opposite poles are connected in series such that mmf ‘s are additive and they are called phase winding of SRM.

PART-B

13 MARKS

1. Described the construction and working of rotary and linear switched reluctance motor?
2. Discuss the following in SRM.
   Methods of rotor position sensing.
   Sensor less operation.
3. Explain the importance of closed loop control in SR motor?
4. Compare and contrast the performance of SR motor and VR stepper motor?
5. Explain the steady state performance analysis of SWRM?
6. Derive the voltage and torque equation of SRM?
7. Discuss the need of rotor position sensor in SRM?
8. Explain with the neat circuit any two configuration of power converter used for the control of SRM?
9. State the advantages of sensor less operation?
10. Explain with the neat diagram, the microprocessor based control of SRM?

UNIT-4

PERMANENT MAGNET BRUSHLESS DC MOTOR

2-MARKS

1. Compare permanent magnet brushless D.C.motor with permanent magnet synchronous motor?

PM brushless D.C motor

- It has concentrated winding on the stator`
- Induces square (or) trapezoidal voltage.
- Used as low power drive.

PMSM

- It has distributed winding on the stator.
- Induces sinusoidal voltage.
- Used as high power drive.

2. What is commutation?

In a conventional DC motor. Commutation is under taken by brushes and commutator but in brushless DC motor it is done by using semiconductor devices such as

transistors. The commutations refers to the process which converts the input direct current to an AC and properly distributes it to each winding in the armature.

3. Distinguish between electronic and mechanic commutators.

MECH commutators:

- Commutators arrangement is located in the rotor.
- The no of commutator segments are very high.
- Shaft position sensing is inherent in the arrangement.

ELECTRONIC commutators:

- Commutator arrangement is located in the stator.
- No of switching devices is limited to 6.
- It requires a separate rotor position senses.

4. Define permeance coefficient.

It is defined as the ratio of air gap permeance to the permeance of permanent magnet assuming the same relative permeability

5. List some permanent magnet materials?

- Alnico materials
- Ferrite (or) ceramic magnet
- Rare earth magnet (samarium-cobalt magnet)
- NdFeB magnet
- Sm2CO17 magnet.

6. **Classify the types of BLDA motor**.

- Surface mounted
- Interior type

7. How the demagnetization occurs in PMBLDC motor?

Demagnetization can be obtained by passing a small negative current in the stator winding.

8. Why brushless permanent magnet DC motor is called as electronically commutated motor?

In normal DC machine brushes are kept in inter polar axis therefore the axis of armature mmf makes an angle of 90 degree electrical in the main field mmf.The important function of commutator and brushes in conventional DC machine in to set up an armature mmf always in quadrature with main field mmf irrespective ofspeed of rotations of the motor. In PMBLDC motor such function is achieved by power convertor semiconducting switching circuitry .Hence this motor is called electronically commutated.

9. List down the some important applications of BLPM DC motor.

- Automotive BLDC motor
- BLDC motor in aerospace.
- In household appliances.
- office automation`
- In industries.

10. What are the merits of the brushless DC motor drive?

- Commutator less motor
- Specified electrical loading is better
- No sparking takes place due to brush.
- Source of EMI is avoided.

11.What are the types of PMDC motor?

- PMDC Motor
- PMBLDC Motor

12.What are the advantages of brushless dc motor drives?

- Regenarative braking is possible
- Speed can be easily controble
- It is possible to have very high speed
- There is no field winding

13. What is optical sensor?

A sensor is operated with photo transistor.It is the optical sensor it is mainly used to sense the rotor position of BLPMDC Motor.

14.What is electronic commutation?

Power electronic switching devices used in commutator with the utilization position sensor are known as electronic commutation.

15.How are the rotation revered in case of pernanet magnet BLDC Motor?

The direction of rotation of PMBLDC can be revered by changing the signals of the commutatir and sensor arrangement.

16.Name the power controller used in PMBLDC motor?

- Rotor position controller
- Micro controller
- Speed controller
- PWM control
- Current control

17. What is hall sensor ?

A sensor is operated with hall effect principle .It is called halled sensor.It is used to sense the rotor position of theBLPMDC Motor.

18. What is magnetic permanence?

It is defined as the magnetic flux density which persist the magnetic material even through the magnetizing forces are completely removed.

19.Define magnetic remeance.

It is defined as the magnetic flux density which posses in the magnetic materials even magnetic forces are completely removed.

20)What are materials used for making hall IC pallet

Indium –antimony

Gallium-arsenide

PART-B (16-Marks)

1.Discuss the magnetic circuit analysis relevant to PM brushless DC motor .Also draw the characteristics. Derive the expressions for permeance coefficient.

2.Illustrate the working of different types of power controllers used for the control of PM brushless DC motors.

3.Discuss the constructions of a PM dc motor.

4.Explain the speed torque characteristics of PMDC motor& EMF Equations.

5.Enumerate in detail about the constructions working principle of rotary & linear SRMS with appropriate schematic diagram.

6.Discuss the various methods of rotor position sensing in SRMS.

7.Explain the closed loop control operations of SRM and its performance characteristics in detail.

8.Discuss the hysteresis type current regulations of PMBLDC motor with neat diagram.

9.Analyze the operation of electronic commutator in PMBLDC motor with neat

10.What are the advantages of BLPM DC motor over conventional DC motor?

11. A permanent magnet DC motor has a load speed of 600 rpm when connected to a 120c supply. The armature resistance is 2.5 ohm and rotational and iron losses may be neglected .Determine the speed when the supply voltage is 60v and the torque is0.5 nm.

12.A PMBLDC motor has torque constant0.12 Nm/A referred to DC supply .Find the motors no load speed when connected to 48v DC supply .Find the stall current & stall torque if armature resistance is 0.15 ohm/phase drop on controller transistor is 2v.

UNIT-5

PERMANENT MAGNET SYNCHRONOUS MOTORS

2-MARKS

1. **Define synchronous reactance in PMSM?**

   In each phase,the voltage is proportional to current I and it is therefore given as the voltage drop (XsI) drops across winding reactance called as “Synchronous Reactance Xs”.By substituting peak flux density into the expression derived earlier for emf and dividing by I we get synchronous reactance as follows

$Xs = 3\pi\mu 0Ns^2lrw/8p^2g''$

This reaction applies to an ideal two pole sine distributed 3 phase winding with Ns turns in series per phase and it neglects the leakage inductance of the slots and end turns.

2. **Write torque and EMF equation of synchronous motor?**

EMF EQUATION:

The rms value of induced emf per phase of the armature winding of an ideal BLPM sine wave motor is expressed as

$Eph=4.44f\emptyset mTph$

TORQUE EQUATION:

The torque equation of BLPM sine wave motor is expressed as,

$T=(3/2)I\sqrt{2}\pi r1l1BNS/2 \sin\beta$ N-m

3. **Write the significance of power controllers of PM synchronous motor?**

For controlling PMSM both in the region of constant torque and flux weakening, assume that the speed controller drive system, generate the torque command Tec according to the speed error. Depending on the mode of operation, the outputs of these controllers are the stator current magnitude command and torque angle command.

4. **Briefly explain the vector control of PM synchronous motor?**

In general for field oriented control (or) vector control stator currents are transformed into a frame of reference moving with the rotor flux. In the PMSM the rotor flux is stationary relative to the rotor. The rotor flux is therefore defined by the mechanical angle of rotation, this is obtained from d rotor.

5. **Mention the various assumptions in deriving the EMF equation of PM synchronous motor?**

- Flux density distribution in the air gap is sinusoidal.
- Rotor rotates with an uniform angular velocity of Wm (rad/sec)
- Armature winding consists of full pitched concentrated similarly located coils of equal number of turns.

6. **Define the term load?**

In synchronous machine, at synchronous speed stator pole axis and rotor pole axis in aligned position. But whenever we increased load, there will be small angle difference between stator pole axis and rotor pole axis. That angle is called load angle.

7. **Write the drawbacks in PM synchronous motor?**

- Leads to losses
- Decrease efficiency
- Power factor operation cannot be controlled.

8. **Explain the distribution factor for PMSM?**

For better utilization of armature core surface and for reducing harmonics in emf, the armature winding in distributed in slots.

Distributed factor, Kdt=sin v/2 / q sin v/2

9. Distinguish PM synchronous motor from BLPM DC motor?

PMBL	PMSM
• A PMBL DC machine is a poly phase synchronous motor. • It is based on the principle of minimum reluctance position.	• A PMSM motor can have a configuration almost identical to that of the conventional synchronous machine with the absence of slip rings and field winding. • It is based on the principle of minimum reluctance position.

10. State the two classifications of PMSM?

- Sinusoidal PMSM
- Trapezoidal PMSM

11. State the applications of PM synchronous motor

- Low integral –hp industrial drives
- Fibre spinning mills
- Applied as direct drive traction motors
- .

12. State theDis advantage of optical sensors.
Provision of high resolution sensor adds the costs of the system
It requires a clean environment

13.What are the uses of optical sensor?

The optical sensor is used as position sensor in PM synchronous motor

These sensors detects the position of the rotating magnets permanent magnet is in rotor and send logic circuits codes to commutation detectors which after processing this code ,activates the semiconductor switches of firing circuits.

14.State the types of power controllers for PM synchronous motor.

PWM inverter using power MOSFETS with microprocessor control.

PWM inverter using BJT with microprocessor control.

15.What is meant by slotless motor?

If the stator teeth of permanent magnet synchronous motor are removed and resulting space is partially filled with additional copper, then the structure is known as slotless motor In this slotless motor, the maximum useless magnet energy is higher than in a conventional slotted motor .

16.State the objectives of vector control`

The objective of vector control in brushless permanent magnet synchronous motor is to make the motor to have better steady state and dynamic performance.

17.Mention the objective of self control.

The objective of self control is to make the armature and rotor field of brushless synchronous motor is to make the motor to have better steady state and dynamic performance.

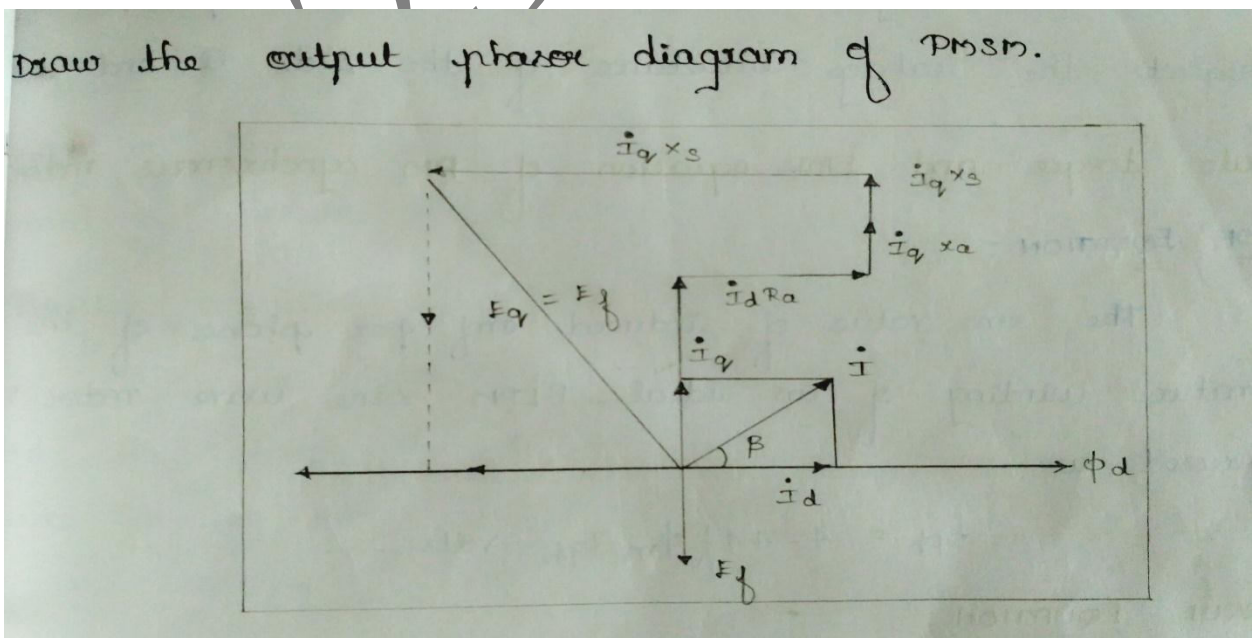
18.What is meant by synchronous reluctance?

The synchronous reactance is the fictitious reactance employed to account for the voltage effects in the armature circuit produced by the actual armature leakage reactance and the chance in the airgap flux caused by armature reaction.

19.What is brushless AC motor ?

The sinusoidal current fed motor ,which has distributed winding on the stator ,permanent magnets on the rotor and the nature of voltage induced in the stator is sinusoidal is known as permanent magnet synchronous motor.

20.Draw the output phasor diagram of PMSM.



13-MARKS

1. Write short notes on

1) Volt- ampere requirements in PMSM motors.

2)Torque- speed characteristics in PMSM motor.

2.Derive EMF and torque equation of PMSM, also draw its phasor diagram.

3.Explain the construction and performance of PMSM with neat diagram.

4.Write short notes on

1)Armature reaction in PMSM.

2) Synchronous Reactance

5.Draw and explain the various power controllers used in PMSM with neat diagram.

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