Course	B.E-EEE(Marine)
Batch	7
Semester	VII
Subject Code	EE1704
Subject Name	Special Electrical Machines
	Part-A
	Unit-1
1	List the applications of synchronous reluctance motors.
2	Draw the voltage and torque characteristics of synchronous reluctance motor.
3	Compare synchronous reluctance motor and induction motor
4	Express and explain the voltage and torque equation of synchronous reluctance motor.
5	Write the different types of controllers used for synchronous reluctance motor.
6	List the merits of 3-phase brushless permanent magnet synchronous motor.
7	List the types of synchronous reluctance motors.
8	Define High level Modulation.
9	Give the operating principle of radial flux motor.
10	Why the power factor of synchronous reluctance motor is much lower than permanent magnet motor?
11	Define cogging.
12	Compare synchronous reluctance motor with conventional synchronous motor.
13	Give the advantages and disadvantages of synchronous reluctance motor.
14	List the application of permenant magnet synchronous motor
15	Draw the phasor diagram of synchronous reluctance motor.
16	What is vernier motor?
17	What is meant by Slow-speed synchronous timing motors
18	what is meant by repulsion motor?
	Unit-2
1	Analyze the various driver circuits used in stepped motor.
2	Define stepping angle.
3	Name the various modes of excitation in stepping motor.
4	Define the terms holding and detent torques as referred to stepper motor.
5	Distinguish the half step and full step operations of a stepping motor.
6	Summarize the principle of operation of a variable reluctance stepper motor.

7	Point out the difference between single and multistack stepping motors.
8	Write the principle of operation of stepping motors.
9	Write the features of stepper motor which are responsible for its wide spread use.
10	What is the function of drive circuit in stepping motor?
11	Define torque constant of a stepper motor.
12	Calculate the stepping angle for a 3phase, 24 pole permanent magnet stepper motor.
13	Analyze why stepper motor work in external logic circuits
14	Draw the block diagram of the drive systems of a stepping motor.
15	Illustrate the principle of hybrid stepping motors.
16	Express the equation for step angle of stepper motor.
17	Draw the equivalent circuit of a winding in stepper motor
18	What is the applications of microstepping VR stepper motor.
19	Define slewing.
	Unit-3
1	What is the significance of closed loop control in switched reluctance motor?
2	List out the advantages of switched reluctance motors.
3	Point out the different power controllers used for the control of switched reluctance motor.
4	Illustrate the different modes of operation of switched reluctance motor.
5	Compare the advantages and disadvantages of the converter circuit with two power
6	Give the advantages of sensorless operation of switched reluctance motor.
7	Generalize the voltage and torque equation of switched reluctance motor.
8	Mention some position sensors in switched reluctance motor.
9	Analyze why SR machines popular in adjustable speed drives.
10	Give the significance of rotor position sensor essential for the operation of SR Motors.
11	List the methods of rotor position sensing in switched reluctance motor.
12	Illustrate the applications of switched reluctance motor.
13	Define energy ratio.
14	Differentiate switched reluctance motor with variable reluctance stepper motor.
15	Draw the torque speed characteristics of SRM
16	Define voltage pulse width modulation control.
17	What is hysteresis current control?
18	Summarize the disadvantages switched reluctance motor.
	Unit-4
1	List the permanent magnet materials used in PMBLDC motors.

2	Compare conventional DC motor and PMBLDC motor.
3	Define Permeance coefficient.
4	Comment on demagnetization in PMBLDC motor.
5	Explain the principle of operation of PMBLDC motor.
6	List out the different classifications of BLPM DC motor?
7	Draw the magnetic equivalent circuit of 2 pole PMBLDC motor.
8	How the permanent magnet motors are named based on the wave shape of emf?
9	Express the torque and Emf equation of square wave brushless motor.
10	Justify the statement: PMBLDC motor is called electronically commutated motor.
11	Compare and contrast mechanical and electronic commutator.
12	Define permanent magnet DC Commutator motor. How it is different from PMBLDC motor?
13	Mention some of the applications of PMBLDC Motor.
14	List out the power controllers used in permanent magnet brushless DC motor.
15	Give short note on hall & optical sensors and its uses?
16	Name the position sensors that are used for PMBLDC motor.
17	How are the directions of rotations reversed in PMBLDC motor?
18	Sketch the ideal phase voltage and current waveform of PMBLDC machine.
19	A permanent magnet DC commutator motor has a stalling torque of 2 Nm. The stall current is5 A. Compute the motor's no-load speed if it is fed with 28 V DC supply.
	Unit-5
1	Compare and contrast Ideal PMSM with practical PMSM.
2	List out the merits and demerits of PMSM?
3	State two classifications of PM synchronous machines with its associated types.
4	Express the torque and EMF equation of PMSM.
5	Enumerate the assumptions to be made in deriving the EMF equation of PMSM?
6	What is meant by synchronous reactance. Also write the expression for self and synchronousreactance of PMSM.
7	Define load angle.
8	State the significance of power controllers of PMSM.
9	Summarize load commutation? Mention its advantages.
10	Write the features of closed loop speed control of loaded commuted Inverter fed synchronous motor drive?
11	Define pulsated mode?
12	Distinguish between self control and vector control PMSM.

13	Write short note on field oriented control of PMSM?
14	What is meant by self motor?
15	what is the difference between SYNREL motor and PM synchronous motor.
16	How PMBLDC motor and PMSM are different?
17	What is meant by slot less motor?
18	What is meant by distribution factor for PMSM.
19	Examine the Volt-ampere requirements of PMSM.
20	List few applications of PMSM?
	Part-B
	Unit-1
1	Generalize the expression for the torque equation for the synchronous reluctance motor.
3	Derive the voltage and torque equations of synchronous reluctance motor.
4	Write a detailed technical note on the variable reluctance motor and the advantages.
5	Draw the phasor diagram with characteristics of synchronous reluctance motor.
6	Discuss the various stator current modes in a synchronous reluctance motor in detail.
7	Discuss the various applications of synchronous reluctance motor.
8	Discuss the main advantages and disadvantages of synchronous reluctance motor.
9	Summarize the design considerations of synchronous reluctance motor.
10	What are the advantages and disadvantages axial and radial flux machines.
11	Draw the steady state phasor diagram of synchronous reluctance motor
12	Write short note on synchronous reluctance motor
13	Compare the performance of synchronous reluctance motor with switched reluctance motor.
14	compare synchronous reluctance motor with permenant magnet synchronous motor.
	Unit-2
1	What are the advantages of closed loop control of stepper motor?
2	Explain briefly about microprocessor based control of stepper motor with an example.
3	Compare the static and dynamic characteristics of stepper motor
4	write short note on Modes of excitations of stepping motors.
5	Draw and Explain the Characteristics of stepping motors.
6	Explain closed loop control of stepper motor.
7	Write a detailed technical note on the bipolar drives for stepper motors.
8	Explain the working of hybrid stepper motor.
9	Draw the torque Vs angle characteristic of permanent magnet stepper motor.
10	Draw and Explain Dynamic characteristics of stepping moptor

11	Discuss any three supressor circuit for stepper motor.
12	Differentiate between unipolar and bipolar windings of stepper motor.
13	What is meant by effects of magnetic saturation in stepper motor .
14	Write short note on pull out torque of stepper motor.
	Unit-3
1	State the advantages of sensorless operation.
2	Explain briefly the various modes of excitation of variable reluctance motor.
3	Discuss the microprocessor based control of switched reluctance motor.
4	Derive the torque equations of the variable reluctance motor and illustrate the various dependent parameters.
5	Compare and contrast the performances of SR motor and VR stepper motors.
6	Explain the importance of closed loop control in SR motor.
7	Discuss the Methods of rotor position sensing in switched reluctance motor
8	Discuss the Sensorless operation.in switched reluctance motor
9	Explain the shaft position sensing of SR motor.
10	Explain the nonlinear analysis of SRM.
11	Derive the expressions for voltage and torque of SR machines.
12	Explain the torque -speed characteristics of switched reluctance motors.
13	Discuss the main advantages and disadvantages of switched reluctance motor.
14	Discuss the various applications of switched reluctance motor.
15	Derve the Torque Expression of SRM.
	Unit-4
1	State the advantages of BLPM DC motor over conventional DC motor.
2	Elucidate in detail about the operation of PMBLDC motor with 180degree magnet arcs and 120degree square-wave phase currents.
3	Describe the constructional aspects of mechanical and electronic commutators of PMBLDC motors
4	Explain the speed-torque characteristics of PMBLDC motor.
5	Differentiate between Mechanical and Electronic Commutators in brushless DC motor.
6	Prove that the torque equation in BLDC motor is similar to that of conventional DC motor
7	Explain in detail about various types of PMBLDC motor with necessary diagrams.(
8	A PMBLDC motor has torque constant of 0.12 Nm/A referred to DC supply. Find the motor's no-load speed when connected to 48 V DC supply. Find the stall current and stall torque if armature resistance is 0.15Ω/phase & drop in controller transistor is 2 V.
9	Compare brushless DC motor and PM commutator motor.

10	Write Short notes on permanent magnet materials.
11	Explain briefly about modes of operation for power controller for PMBLDC motor.
12	Derive the EMF equation of PMBLDC motor.
13	Explain briefly about Principle of operation of PMBLDC motor.
14	Compare PMBLDC and SRM motor.
15	explain how PMBLDC motor Called as Electronically commutated motor.
	Unit-5
1	What is armature reaction. Discuss its effects on PMSM.
2	Explain the concept of vector control and how it achieved in PMSM.
3	Discuss in detail about various rotor configurations of Permanent Magnet Synchronous machines.
4	State the applications of PMSM.
5	With necessary block diagram explain in detail about FOC for PMSM.
6	Discuss in detail about Volt-ampere requirements of PMSM.
7	What are the classifications of PMSM with respect to directin of field flux
8	List the Features of PMSM
9	Compare Self and vector controlled PMSM
10	Briefly explain the vector and microprocessor based control of PMSM.
11	Derive the emf Equation of PMSM.
12	Compare SRM amd PMSM
13	Explain torque speed Characteristics of PMSM
14	Discuss the types of rotor construction in permanent magnet synchronous motor.
15	Write short note on microprocessor based PMSM.
	Part-C
	Unit-1
1	Discuss in detail the principle of operation and constructional features of different types of synchronous reluctance motor.
2	Summarize the design considerations of synchronous reluctance motor.
3	Explain circle diagram and torque –speed characteristics of synchronous reluctance motor.
4	Differentiate between axial and radial airgap synchronous reluctance motors.
5	Derive the open circuit emf of synchronous reluctance motor.
	Unit-2
1	Describe the operation of variable reluctance type stepper motor with different modes of operation.
3	Discuss in detail, about the construction and working principle of Variable reluctance stepper motor.

4	Explain with a neat diagram of single and multistack configuration in stepper motors.
5	Explain the working of hybrid stepper motor.
6	Discuss the principle of operations of permanent magnet stepper motor with torque Vs angle characteristics.
	Unit-3
1	Explain with a neat circuit any two configuration of power converters used for the control of switched reluctance motor.
2	Explain with a neat diagram the constructional details and working of rotary switched reluctance motor.
3	Summarize the steady state performance analysis of switched reluctance motor.
4	Explain the closed loop control analysis of switched reluctance motor.
5	Explain the construction and working of switched reluctance motor with neat sketches.(
	Unit-4
1	Derive an expression for permeance coefficient for PMBLDC motor.
2	Explain in detail about the construction and working principle of PMBLDC motor.
3	Discuss in detail about magnetic circuit analysis of PMBLDC motor. Also draw its characteristics.
4	Analyze the operation of electronic commutator in PMBLDC motor with necessary diagrams.Explain the operation of the same.
5	Write a note on power controllers used for PMBLDC motor and explain the each blocks associated in it.
6	Explain the closed loop control scheme of a PMBLDC motor drive with a suitable schematic diagram.
	Unit-5
1	Explain the construction and working principle of operation of PMSM.
2	Derive the torque and EMF equations of PMSM.
3	Deduce the expression for synchronous reactance of PM synchronous motor.
4	Derive the expression for power input and torque of a PMSM. Explain how its torque speed characteristics are obtained.
5	Derive Self and Mutual Inductance of Permanent magnet Synchronous motor.
6	Discuss the current control scheme of permanent magnet synchronous motor in detail.