Code No: **R164102G** **R16** **Set No. 1**

IV B.Tech I Semester Regular Examinations, October/November - 2019

SPECIAL ELECTRICAL MACHINES

(Electrical and Electronics Engineering)

Time: 3 hours **Max. Marks: 70**

Question paper consists of Part-A and Part-B
Answer ALL sub questions from Part-A
Answer any FOUR questions from Part-B

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PART–A *(14 Marks)*

1. a) What are the most common types of magnetism? [2]
   b) What are the advantages of bipolar stepper motor compared to unipolar stepper motors? [2]
   c) Define magnetic Reluctance. [2]
   d) List the applications of BLDC motors. [3]
   e) What are the differences between PMSM and BLDC motors? [3]
   f) What are linear motors? [2]

PART–B *(4x14 = 56 Marks)*

2. a) Give the classification of permanent magnet materials. Which materials are used in permanent magnets? [7]
   b) Discuss the advantages and limitations of permanent magnet machines. [7]

3. a) What is a stepper motor? What is its principle? Discuss its applications. [7]
   b) With a neat block diagram, explain the open loop control of 3-phase VR Stepper Motor. [7]

4. a) What are the advantages of Switched Reluctance Motors? [5]
   b) Write the equivalent circuit of a Switched Reluctance Motor and derive the expression for torque produced by the motor. [9]

5. a) Explain the operation of a BLDC motor. Also write the expressions for Torque and EMF of BLDC motor. [7]
   b) What are the reasons for ripples in the torque produced by the BLDC motors? Suggest any scheme for torque ripple reduction. [7]

6. a) What are BLDC motors? How are they differ from permanent magnet synchronous motors? [7]
   b) Derive the Torque and EMF equations for permanent magnet synchronous motors. [7]

7. a) Briefly discuss different types of linear motors. [4]
   b) Discuss the application of single sided linear induction motor for electric traction. [10]

Code No: **R164102G** **R16** **Set No. 2**

IV B.Tech I Semester Regular Examinations, October/November - 2019

SPECIAL ELECTRICAL MACHINES

(Electrical and Electronics Engineering)

Time: 3 hours **Max. Marks: 70**

Question paper consists of Part-A and Part-B
Answer ALL sub questions from Part-A
Answer any FOUR questions from Part-B

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PART–A *(14 Marks)*

1. a) Why steel is preferred for making permanent magnet? [2]
   b) Why can't the stepper motors run continuously? [2]
   c) Deduce the relationship between Reluctance and Inductance. [2]
   d) Write the expression for torque produced by a BLDC motor. [2]
   e) What are the advantages of permanent magnet machines? [3]
   f) List various applications of linear motors. [3]

PART–B *(4x14 = 56 Marks)*

2. a) What is B-H curve? Discuss the characteristics of soft magnetic materials. [9]
   b) Compare between electronically commutated dc motor and conventional dc motor. [5]

3. a) Explain the principle of operation and construction of Variable Reluctance stepper motor. [9]
   b) Discuss the principle of hybrid type synchronous stepper motor. [5]

4. a) Explain the constructional details of a 4-phase 8/6 switched reluctance motor. [7]
   b) Discuss the application areas of switched reluctance motor. Also list the main limitations of switched reluctance motors. [7]

5. a) Discuss the merits and applications of BLDC motors. [6]
   b) With the help of schematic diagram and necessary waveforms, discuss the operation of a square wave brushless DC motors with 120^{o} operation. [8]

6. a) Discuss the constructional differences between permanent magnet synchronous motor and BLDC motors. [8]
   b) List and discuss the applications of sine wave permanent magnet Brushless motors. [6]

7. a) Discuss the principle of operation of linear induction motors. [7]
   b) Draw and explain the equivalent circuit of linear induction motor. [7]

Code No: **R164102G** **R16** **Set No. 3**

IV B.Tech I Semester Regular Examinations, October/November - 2019

SPECIAL ELECTRICAL MACHINES

(Electrical and Electronics Engineering)

Time: 3 hours **Max. Marks: 70**

Question paper consists of Part-A and Part-B
Answer ALL sub questions from Part-A
Answer any FOUR questions from Part-B

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PART–A *(14 Marks)*

1.	a)	Why B-H curve is not linear?	[2]
	b)	A hybrid stepping motors have 200 rotor teeth, what is full step angle?	[2]
	c)	What is Co-energy?	[2]
	d)	Draw and explain the shape of back-EMF of a BLDC motor.	[3]
	e)	What are the differences between the stators of PMSM and BLDC motors?	[3]
	f)	What are different types of linear motors?	[2]

PART–B *(4x14 = 56 Marks)*

2.	a)	What is hysteresis loop? Discuss the characteristics of hard magnetic materials.	[7]
	b)	List the applications of permanent magnets. Also discuss the effect of temperature on permanent magnets.	[7]
3.	a)	List and discuss the applications of stepper motors.	[5]
	b)	With the help of a neat block diagram, explain the closed loop control of 2-phase hybrid stepping motor.	[9]
4.	a)	What is the need for rotor passion sensor in switched reluctance motor control?	[7]
	b)	Explain the torque production mechanism in switched reluctance motors.	[7]
5.	a)	What are the advantages of BLDC motors? Explain the constructional details of a BLDC motor.	[8]
	b)	Draw and discuss the Torque-speed characteristics of BLDC motors.	[6]
6.	a)	Discuss different types of rotors in permanent magnet synchronous machines.	[7]
	b)	Draw and discuss the phasor diagram of sine wave permanent magnet brushless motors.	[7]
7.	a)	Differentiate between linear motors and rotary motors.	[7]
	b)	Draw the constructional details of a linear induction motor.	[7]

Code No: **R164102G** **R16** **Set No. 4**

IV B.Tech I Semester Regular Examinations, October/November - 2019

SPECIAL ELECTRICAL MACHINES

(Electrical and Electronics Engineering)

Time: 3 hours **Max. Marks: 70**

Question paper consists of Part-A and Part-B
Answer ALL sub questions from Part-A
Answer any FOUR questions from Part-B
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PART–A *(14 Marks)*

1.	a)	What is Curie point?	[2]
	b)	List any four applications of stepper motors.	[2]
	c)	List main disadvantages of Switched Reluctance Motors.	[3]
	d)	What is back-EMF of a motor?	[2]
	e)	List the applications of Sine wave Permanent Magnet Brushless Motors.	[3]
	f)	List any four applications of linear motors.	[2]

PART–B *(4x14 = 56 Marks)*

2.	a)	What are the merits of permanent magnet motors? Where are permanent magnet motors used?	[7]
	b)	How does temperature affect permanent magnets? Discuss in detail.	[7]
3.	a)	Compare between open loop and closed loop control of stepper motors.	[6]
	b)	Explain how a full-step mode and half-step mode are implemented in stepper motors? Which mode produces more torque output?	[8]
4.	a)	With a neat schematic diagram, explain the operation of any two power converters for a 4-phase 8/6 switched reluctance motor.	[10]
	b)	List the advantages and applications of switched reluctance motors.	[4]
5.	a)	Draw the constructional details of a surface mounted type permanent magnet BLDC motor.	[7]
	b)	What is the need for rotor position sensing in the control of BLDC motors? Explain.	[7]
6.	a)	Draw and discuss the Torque-speed characteristics of PMSM.	[7]
	b)	Make a comparison between square wave and sine wave permanent magnet motors.	[7]
7.		Explain the working of linear induction motors. Draw the schematic and discuss the operation of linear induction motor drive for traction application.	[14]