Code No: **RT42022C** **R13** **Set No. 1**

**IV B.Tech II Semester Regular/Supplementary Examinations, April - 2018**

# 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 THREE questions from Part-B***

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## PART–A *(22 Marks)*

1. a) Why the number of stator and rotor poles are not same in Switched Reluctance motors? Explain. [4]
   b) Differentiate between Stepper motors and Switched Reluctance motors. [4]
   c) Compare between permanent magnets and electro magnets. [4]
   d) What is a BLDC motor? Mention their advantages. [4]
   e) Explain the principle of linear induction motor. [3]
   f) List the motors used in electric traction. [3]

## PART–B *(3x16 = 48 Marks)*

2. a) Discuss the merits of Switched Reluctance motors compared to induction motors. [8]
   b) Explain the torque production mechanism in Switched Reluctance motors. [8]

3. a) List and discuss different types and applications of stepper motors. [8]
   b) Define the terms with respect to a stepper motor: *stator pole pitch, rotor pole pitch* and *step angle*. [4]
   c) For a three-phase 12/8 VR stepper motor, calculate stator pole pitch, rotor pole pitch and full step angle. [4]

4. What are the advantages of PM DC machines? Draw and explain the constructional details of a permanent magnet DC machine. [16]

5. a) What is a commutator? What is its need in electrical machines? Compare between mechanical and electronic commutators. [8]
   b) Prove that the PM BLDC machines have 15% more power density than the PMSM. [8]

6. What are linear motors? Explain different types and applications of linear motors. [16]

7. a) Discuss the main characteristics of traction drives. [8]
   b) Discuss the application of Linear Induction Motors for electric traction. [8]

Code No: **RT42022C** **R13** **Set No. 2**

**IV B.Tech II Semester Regular/Supplementary Examinations, April - 2018**

# 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 THREE questions from Part-B***

*****

## PART–A *(22 Marks)*

1. a) Define the term Reluctance. Also derive the relation between reluctance and inductance. [4]
   b) Define step angle of a Stepper motor. For a three-phase 12/8 VR stepper motor, calculate step angle. [4]
   c) Discuss the advantages of permanent magnet DC motor over conventional DC motors. [4]
   d) Compare between BLDC motor and PMSM. [4]
   e) List the applications of linear induction motors. [3]
   f) Why DC series motor is better suitable for traction than DC shunt motor? [3]

## PART–B *(3x16 = 48 Marks)*

2. What is the need for power converter in the operation of Switched Reluctance motors? Explain any two power converters for a three-phase, 6/4 Switched Reluctance motor. [16]

3. a) With a block diagram, explain the open loop control of a stepper motor. [8]
   b) Explain the torque production in variable reluctance stepper motors. [8]

4. a) What is a PMDC motor? Explain its working. [8]
   b) Derive the expression for torque of a PMDC motor. [8]

5. What are the merits of brushless DC motors? With a neat block diagram, explain the closed loop control of a BLDC motor. [16]

6. a) Compare between Linear synchronous motor and Linear Induction motor. [8]
   b) Explain the working of linear induction motor. [8]

7. a) Compare between DC traction and AC traction. [8]
   b) A train driven by separately excited dc motors has better co-efficient of adhesion than driven by series motor. Justify the statement. Draw the simplified speed/time curve for the main line services and show all necessary periods. [8]

Code No: **RT42022C** **R13** **Set No. 3**

**IV B.Tech II Semester Regular/Supplementary Examinations, April - 2018**

# 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 THREE questions from Part-B***

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## PART–A *(22 Marks)*

1. a) List the advantages and applications od Switched Reluctance Motors. [4]
   b) What are the differences between a Stepper motor and a Servo motor? [4]
   c) List the main limitations of permanent magnet machines. [4]
   d) Write the shape of back EMFs of a BLDC motor. [3]
   e) Define and explain Goodness factor. [4]
   f) What are the advantages of electric traction? [3]

## PART–B *(3x16 = 48 Marks)*

2. a) What is the need for rotor position sensor in the control of Switched Reluctance motors? Explain the working of hall sensors. [8]
   b) Explain the control of Switched Reluctance motor using asymmetric power converter. [8]

3. a) What are Hybrid stepper motors? Explain their working. [8]
   b) Compare between open loop and closed loop control of stepper motors. [8]

4. a) What is a PMDC motor? Draw and explain its equivalent circuit. [8]
   b) Discuss the advantages and applications of PM DC motors. [8]

5. a) Compare between BLDC motors and PMSMs. [8]
   b) Discuss the advantages and applications of BLDC motors. [8]

6. With a neat diagram, explain the construction of linear synchronous motor. Also list their applications. [16]

7. a) Discuss different supply systems used in electric traction. [8]
   b) Draw and explain a typical Speed –Time curve for train movement. [8]

Code No: **RT42022C** **R13** **Set No. 4**

**IV B.Tech II Semester Regular/Supplementary Examinations, April - 2018**

**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 THREE questions from Part-B***

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## PART–A *(22 Marks)*

1. a) Explain the operating principle of Switched Reluctance Motors. [4]
   b) List and discuss the applications of Stepper motors. [4]
   c) List the applications of PMDC motors. [4]
   d) What is the need for position sensor in BLDC motor? [4]
   e) List different types of Linear motors. [3]
   f) What are the motors used in electric traction? [3]

## PART–B *(3x16 = 48 Marks)*

2. a) Draw and discuss the shape of phase inductance of a Switched Reluctance motor with respect to rotor position. [8]
   b) List and discuss various advantages and applications of Switched Reluctance motors. [8]

3. a) With a neat diagram, explain the constructional details of a variable reluctance stepper motor. [8]
   b) Explain torque production in stepper motor. What is the effect of hybrid stepping in the torque production? [8]

4. a) What are moving coil motors? Explain its working and list their applications. [8]
   b) What are electromagnets? Discuss the advantages and disadvantages of permanent magnets over electromagnets. [8]

5. a) Draw and discuss the back emf waveforms of a three phase BLDC motor. [6]
   b) With a neat schematic diagram, explain the sensorless control of a three phase BLDC motor. [10]

6. Discuss the construction, principle of operation and various applications of liner induction motor. [16]

7. What are tractions drives? Explain the use of single sided linear induction motor for traction drives. [16]