USN | | | | | | | | | |

15EE554

Fifth Semester B.E. Degree Examination, Aug./Sept. 2020
Special Electrical Machines

Time: 3 hrs. 　　　　　　　　　　　　　　　　　　　　　　　　　Max. Marks: 80

Note: *Answer any FIVE full questions, choosing ONE full question from each module.*

Module-1

1　a. Draw and explain the structure of a multistack variable reluctance stepper motor. **(08 Marks)**
　b. Explain micro processor base control of stepper motor also give the flow chart for controller implementation. **(08 Marks)**

OR

2　a. What is half step mode operations of stepper motor? Explain. **(06 Marks)**
　b. List the advantages and disadvantages of permanent magnet stepper motor. **(05 Marks)**
　c. A stepper motor has a step angle of 1.8°. Find :
　　i) Resolution ii) number of steps required for 50 revolutions iii) shaft speed if the stepping frequency is 5000 pulses/sec. **(05 Marks)**

Module-2

3　a. With the help of a neat sketch, explain the construction and principles of working of a switched reluctance motor. **(08 Marks)**
　b. Compare electronic commutator to mechanical commutator. **(05 Marks)**
　c. List the methods to increase the torque developed in switched reluctance motor. **(03 Marks)**

OR

4　a. Describe L–θ profile of a switched reluctance motor. **(08 Marks)**
　b. A four phase eight – pole switched reluctance motor has six rotor teeth. Find the step angle and commutation frequency for a speed of 6000 rpm. **(04 Marks)**
　c. Explain the principle of working of a permanent magnet DC motor. **(04 Marks)**

Module-3

5　a. Explain the principle of operation of permanent magnet synchronous motor. **(06 Marks)**
　b. Draw the vector diagram of synchronous reluctance motor. **(04 Marks)**
　c. A three phase, 4 pole, start connected synchronous motor has 72 slots with 20 conductors per slot. The flux per pole is 0.05wb and the speed is 1500 rpm. Assuming the full pitched coil and no skewing. Find the phase voltage and line voltage. **(06 Marks)**

OR

6　a. Explain self control of permanent magnet synchronous motor. Also draw the control scheme. **(10 Marks)**
　b. A 3 phase, 4 pole, 50Hz, 400V star connected synchronous reluctance motor has direct axis and quadrature axis synchronous reactances of 8 ohm and 2 ohm respectively. For a full load torque of 80N-m, find the load angle, line current and power factor. Neglect armature resistance and mechanical losses. **(06 Marks)**

Module-4

7 a. Explain the constructions and working of repulsion motor. (06 Marks)
  b. List the special features of DC servomotor has compared to conventional DC motor.
  (04 Marks)
  c. Explain the construction and working of single phase AC servomotor. (06 Marks)

OR

8 a. Draw the equivalent circuit of servomotor applied with unbalanced voltages and derive torque equations. (10 Marks)
  b. List the applications of AC series motor. Also draw its phasor diagram. (06 Marks)

Module-5

9 a. List the advantages of linear induction motor compared to rotating motors. (04 Marks)
  b. Explain the constructions and operation of double sided brushless permanent magnet axial flux motor. (08 Marks)
  c. Discuss the applications of permanent magnet axial flux machines. (04 Marks)

OR

10 a. Discuss different types of stator windings used in permanent magnet axial flux machines.
  (08 Marks)
  b. With the help of neat diagrams. Explain the constructions and working of axial field linear induction motors. (08 Marks)

* * * * *