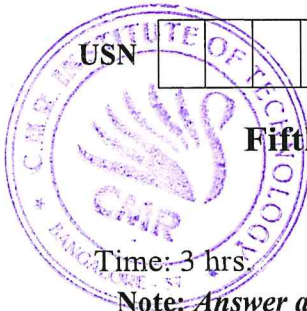


CBCS SCHEME

17EE554



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

Time: 3 hrs.

Max. Marks: 100

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

Module-1

- 1 a. Describe the construction and working of a Four-phase, Eight pole variable reluctance stepper motor. (08 Marks)
- b. With a block diagram and flowchart, explain the microprocessor based control of stepper motor. (08 Marks)
- c. A stepper motor has a revolution of 500 steps/rev in single phase ON mode. Find its resolution in half step mode. Find the number of steps required for the rotor to move a distance of 72° . (04 Marks)

OR

- 2 a. Explain the construction and working of permanent magnet stepper motor in the following modes
i) Single phase ON mode
ii) Two phase ON mode. (10 Marks)
- b. Give the block diagram for the closed loop control of stepper motor and explain. (06 Marks)
- c. A stepper motor has a resolution of 200 steps/rev. Find the pulse rate required to run the motor at 2400 rpm. (04 Marks)

Module-2

- 3 a. List the constraints on pole arc and tooth arc. (06 Marks)
- b. Draw the drive circuit and explain the principle of operation of BLDC motor. (08 Marks)
- c. Compare electronic commutator to mechanical commutator. (06 Marks)

OR

- 4 a. Derive the torque equation and equivalent circuit of BLDC motor. (06 Marks)
- b. A three phase SRM has six stator poles and four rotor teeth. Draw the feasible zone for stator and rotor pole arcs. Design the pole arc and rotor tooth arc. (08 Marks)
- c. A permanent magnet DC motor has an armature resistance of 1.03Ω . It draws a current of 1.25A at no load with 50V supply running at 2100 rpm. Find
i) rotational losses and
ii) output power when it runs at 1700 rpm at 48V supply
iii) speed voltage constant. (06 Marks)

Module-3

- 5 a. Discuss self control of permanent magnet synchronous motor. Also give the block diagram of the control scheme. (12 Marks)
- b. Explain the construction and operation of the synchronous reluctance motor. (08 Marks)

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OR

- 6 a. Derive the emf equation of permanent magnet synchronous motor. (10 Marks)
 b. Draw the phasor diagram of synchronous reluctance motor. (05 Marks)
 c. Compare conventional and permanent magnet synchronous motor. (05 Marks)

Module-4

- 7 a. Derive the torque equations of single phase AC series motor. (08 Marks)
 b. Derive the transfer functions of field controlled DC servo motor. (08 Marks)
 c. List the characteristic features of repulsion motor. (04 Marks)

OR

- 8 a. Derive the torque equation of repulsion motor with two stator windings. (08 Marks)
 b. Derive the transfer function of armature controlled DC servomotor. (08 Marks)
 c. Give the circuit diagram of repulsion motor and draw its phasor diagram. (04 Marks)

Module-5

- 9 a. Describe the following with respect to linear induction motors
 i) transverse edge effect
 ii) End effect
 iii) entry and exit transients (08 Marks)
 b. Explain the constructions and operations of double sided brushless permanent magnet axial flux machine. (08 Marks)
 c. The secondary sheet of linear inductions motor having a pole pitch of 10cm move at a velocity 8 m/s. If the supply frequency is 50Hz, find the slip. (04 Marks)

OR

- 10 a. List the factors to be considered for the choice of
 i) specific magnetic loading
 ii) specific electric loading and explain (10 Marks)
 b. With the help of a neat sketch, explain the construction of multi disc permanent magnet Axial flux machine. (06 Marks)
 c. A linear induction motor has a pole pitch of 5cm. It is supplied with 50Hz voltage. Find speeds of the field and runner, if the slip is 0.2. (04 Marks)
