Reg. No. : | | | | | | | | | | | | |

Question Paper Code : 80544

B.E./B.Tech. DEGREE EXAMINATIONS, APRIL/MAY 2024

Sixth Semester

Electrical and Electronics Engineering

EE 8005 – SPECIAL ELECTRICAL MACHINES

(Regulations 2017)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — ($10 \times 2 = 20$ marks)

1. What is holding torque in stepping motor?

2. Why stepper motor works in external logic circuit?

3. Give the significance of closed loop control in switched reluctance motor.

4. Mention any four advantages of switched reluctance motor.

5. What are the merits of permanent magnet brushless DC motor compared with conventional DC shunt motor.

6. Define the term peak recovery current in PMBLDC motor.

7. Give the expression for the torque of permanent magnet synchronous reluctance motor.

8. Mention the applications of permanent magnet synchronous motor.

9. Why rotor position sensor is essential for the operation of SRM?

10. Give the applications of linear synchronous motor.

PART B — (5 × 13 = 65 marks)

11. (a) (i) Describe the operation of a variable reluctance type stepper motor. (6)

(ii) What is the motor torque T_m required to accelerate the initial load of 10^{-4} kgm^2 from $\omega_1 = 200$ and $\omega_2 = 300$ rad/sec during 0.2 sec. Frictional load torque is 0.06Nm. (7)

Or

(b) (i) Explain with neat diagram the bipolar drive circuits in stepper motor. (6)

(ii) Explain single and multistack configurations of a stepper motor. (7)

12. (a) Discuss the type of control strategy used in different regions of the torque speed characteristics of switched reluctance motor. (13)

Or

(b) Discuss the necessity of power electronic circuit in SR motor. Explain the different types. (13)

13. (a) (i) Derive the expression for the emf of a permanent magnet brushless DC motor. (6)

(ii) A PMDC commutator motor has a no load speed of 6000rpm when connected to a 120V supply. The armature resistance is 2.5 ohms and rotational and iron losses are neglected. Determine the speed when the supply voltage is 60V and torque is 0.5Nm. (7)

Or

(b) Discuss about the power controllers used in PMBDC motor. (13)

14. (a) (i) Derive the emf equation of permanent magnet synchronous motor. (6)

(ii) A three phase 16 pole synchronous motor has a star connected winding with 144 slots and 10 conductors per slot. The flux per pole is 0.03wb, sinusoidally distributed and speed is 375 rpm . Find the frequency, phase emf and line emf. Assume full pitched coil. (7)

Or

(b) Explain about Microprocessor based control system, in permanent magnet synchronous motor. (13)

15. (a) Explain the principle and operation of a linear induction motor and draw its characteristics. (13)

Or

(b) Discuss the necessity of power electronic circuit in SR motor. Explain the different types of converter circuits in detail. (13)

PART C — (1 × 15 = 15 marks)

16. (a) What is the role of suppressors in drive circuit of stepping motor? Explain the different types of suppressor circuits with neat diagram and give their suitable applications. (15)

Or

(b) Explain the performance characteristics of Hysteresis motor and repulsion motor with their suitable applications. (15)