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

Question Paper Code : 30549

B.E./B.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 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 × 2 = 20 marks)

1. List the types of stepper motors.
2. Write how forward and reverse direction control with stepper motors.
3. Define torque prediction in SRMs.
4. Mention the role of power controllers in SRM
5. List two types of permanent magnets used in brushless DC motors.
6. Write the purpose of a power converter circuit in brushless DC motors.
7. Draw the phasor diagram of PMSM.
8. How micro controllers are used as digital controller in PMSMs.
9. Is hysteresis motor AC or DC.
10. Write the main function of a repulsion motor.

PART B — (5× 13 = 65 marks)

11. (a) Explain the principle of operation of stepper motors. (13)

Or

(b) Analyze the torque prediction and linear characteristics of a stepper motor in a real-world application. (13)

12. (a) Explain the steady-state performance characteristics of SRMs. (13)

Or

(b) Describe the control of SRM drive in sensor-less operation mode. (13)

13. (a) Derive the EMF and torque equations of Permanent Magnet Brushless D.C. Motor. (13)

Or

(b) Discuss the characteristics and speed control mechanisms of brushless DC motors. (13)

14. (a) Explain the constructional features and principle of operation of PMSMs. (13)

Or

(b) Describe the performance characteristics of sine wave motors with deriving speed-torque characteristics. (13)

15. (a) Discuss the principle of operation of synchronous reluctance motors. (13)

Or

(b) Explain the principle of operation and characteristics of linear induction motor. (13)

PART C — (1 × 15 = 15 marks)

16. (a) A3 phase, 4 pole, brushless PM rotor has 36 stator slots. Each phase winding is made up of three coils per pole with 10 turns per coil. The coil span = 7 slots. If the fundamental component of magnet flux is 1.8 mWb. Estimate the open circuit phase emf at 3000 rpm. (15)

Or

(b) A three phase 230V, 50Hz, 4 pole star connected synchronous reluctance motor with negligible armature resistance has X_{sd} = 22.5 ohm and X_{sq} = 3.5 ohm. The load torque is 12.5 Nm. The voltage frequency ratio is maintained constant at rated value. If the supply frequency is 50 Hz, determine

(i) torque angle (5)

(ii) line current (5)

(iii) input power factor (5)