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

Question Paper Code : 40998

B.E./B.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2024.

Fifth/Sixth/Seventh Semester

Electrical and Electronics Engineering

EE 3009 – SPECIAL ELECTRICAL MACHINES

(Regulations 2021)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. List any two features of stepping motors from the viewpoint of application.

2. Write the relation between number of rotor teeth and steps per revolution.

3. Draw the general torque/speed characteristics of switched reluctance motor.

4. Why slight increase in the slot area of SRM is permitted?

5. Write the unique feature of brushless dc in a BLDC motor. Why is it so?

6. Sketch the complete B-H curve for a typical 'hard' permanent magnet.

7. Express the EMF equation of permanent magnet synchronous motor.

8. Write the salient features of PMSM.

9. Why is the hysteresis motor free from magnetic vibrations?

10. Name any four applications of linear motors.

PART B — (5 × 13 = 65 marks)

11. (a) Explain closed-loop drive system for steppers motor with block diagram.

Or

(b) Describe the measurement of static and dynamic characteristics of stepper motor.

12. (a) Explain the constructional features and operating principle of SRM.

Or

(b) With neat circuit diagram, describe the converter circuits for three-phase SR motor.

13. (a) Draw the block diagram and explain the structure of controller for brushless DC PM motor drive.

Or

(b) Explain the torque/speed characteristics of ideal brushless dc motor with neat sketch.

14. (a) Describe the design of current and speed controllers for PMSM.

Or

(b) Discuss in detail the constructional features and characteristics of synchronous reluctance motor.

15. (a) Explain the principle of operation and characteristics of Hysteresis motor.

Or

(b) With relevant diagrams, discuss the characteristics of AC series motor.

PART C — (1 × 15 = 15 marks)

16. (a) A stepper motor has a step angle of 2.5. Determine

(i) Resolution

(ii) Number of steps per shaft to make 25 revolutions

(iii) Shaft speed if starting stepping frequency is 3600 pulse/sec

Or

(b) Sketch the general speed-torque curve of SR motor and discuss the type of control strategy used for different regions of the curve. Sketch the typical phase current wave forms of low speed operation.

———————