

Reg. No. :

--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Question Paper Code : R 81249

B.E./B.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2025.

Fifth/Sixth/Seventh/Eighth Semester

Electrical and Electronics Engineering

EE3009 – SPECIAL ELECTRICAL MACHINES

(Regulations 2021)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Define step angle.
2. State the significance of pull-in torque and pull-out torque.
3. List any two applications of switched reluctance motors with justification.
4. What is the role of power controller in an SRM drive?
5. Mention the function of inverter in BLDC motor control.
6. Write the relationship between back EMF and speed in a BLDC motor.
7. What is the significance of phasor diagrams in PMSM analysis?
8. State any two differences between PMSM and synchronous reluctance motor.
9. Why are AC series motors suitable for traction applications?
10. What is the basic principle behind the operation of a linear motor?

PART B — (5 × 13 = 65 marks)

11. (a) Discuss the static and dynamic characteristics of stepper motors.

Or

- (b) Explain the constructional features and principle of operation of stepper motors with suitable diagrams.

12. (a) Explain the steady-state performance analysis of switched reluctance motor.

Or

- (b) Illustrate sensor less operation of SRM using inductance-based rotor position estimation methods.

13. (a) Describe the fundamentals and classification of permanent magnets used in brushless DC motors.

Or

- (b) Discuss the use of Hall sensors for position sensing in PMBLDC motor with necessary block diagram.

14. (a) Derive the EMF and torque equations of a PMSM and draw the steady-state phasor diagram.

Or

- (b) Draw the torque-speed characteristics of a PMSM and discuss its control.

15. (a) Describe the principle of operation and characteristics of a hysteresis motor.

Or

- (b) Describe the construction, operating principle, and characteristics of an AC series motor.

PART C — (1 × 15 = 15 marks)

16. (a) Given a high-precision application requiring smooth motion and zero resonance, evaluate whether an open-loop or closed-loop stepper motor system is more appropriate and justify your choice.

Or

- (b) An SRM drive exhibits high torque ripples at low speeds; analyze the contributing factors and recommend control strategies to minimize the ripple.