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**Question Paper Code : 31411**

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2013.

Seventh Semester

Electrical and Electronics Engineering

EE 2403/EE 73/10133 EEE 25 — SPECIAL ELECTRICAL MACHINES

(Regulation 2008 / 2010)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. What are the merits of 3-phase brushless permanent magnet synchronous motor?
2. What are SYNREL motors?
3. Write the features of stepper motor which are responsible for its wide spread use?
4. Define : 'Stepping angle'.
5. What is the significance of closed loop control in switched reluctance motor?
6. List out the advantages of switched reluctance motors.
7. Distinguish between electronic and mechanical commutators.
8. Draw the magnetic equivalent circuit of PMSM motor.
9. Write torque and EMF equation of PM synchronous motor.
10. Write the significance of power controllers of permanent magnet synchronous motors.

PART B — (5 × 16 = 80 marks)

11. (a) Discuss in detail the principle of operation and constructional features of different types of synchronous reluctance motor. (16)

Or

- (b) Explain the torque speed characteristics of synchronous reluctance motor in detail. (16)

12. (a) Explain the construction operation of variable reluctance type stepper motor. Also explain about micro stepping. (16)

Or

- (b) (i) Derive the reluctance torque of a stepper motor. (8)  
(ii) Calculate the stepping angle for a 3 phase 24 pole permanent magnet type stepper motor. (8)

13. (a) Explain the construction and working of switched reluctance motor with neat sketches. (16)

Or

- (b) (i) Explain the importance of closed loop control in SR motor. (10)  
(ii) Compare and contrast the performances of SR motor and VR stepper motors. (6)

14. (a) (i) Discuss the construction of a permanent magnet dc motor. (8)  
(ii) A permanent magnet DC commutator motor has a no-load speed of 600 rpm when connected to a 120 V supply. The armature resistance is  $2.5 \Omega$  and rotational and iron losses may be neglected. Determine the speed when the supply voltage is 60 V and the torque is 0.5 Nm. (8)

Or

- (b) (i) Explain the speed torque characteristics of PMDC motor. (8)  
(ii) A PMSLDC motor has torque constant  $0.12 \text{ Nm/A}$  referred to DC supply. Find the motor's no-load speed when connected to 48 V DC supply. Find the stall current and stall torque if armature resistance is  $0.15 \Omega/\text{phase}$  and drop in controller transistor is 2V. (8)

15. (a) Explain the construction and performance of a permanent magnet synchronous motor with neat diagram. (16)

Or

- (b) Derive the emf and torque equation of permanent magnet synchronous motor. (16)