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Question Paper Code : 51517

B.E./ B.Tech. DEGREE EXAMINATION, MAY/JUNE 2016

Seventh Semester

Electrical and Electronics Engineering

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

(Regulations 2008/2010)

(Common to PTEE 2403/10133 EEE 25 – Special Electrical Machines for B.E (Part-Time) Sixth/Seventh Semester- EEE-Regulations 2009/2010)

Time : Three Hours

Maximum : 100 Marks

Answer ALL questions.

PART – A (10 × 2 = 20 Marks)

1. List the applications of synchronous reluctance motors.
2. Draw the voltage and torque characteristics of Synchronous reluctance motor.
3. Name the various driver circuits used in stepped motor.
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. Why Brushless Permanent Magnet (BLPM) DC motor is called as electronically commutated motor ?
8. List down some important applications of BLPM DC motor.
9. Define synchronous reactance in PMSM.
10. Draw the output phasor diagram of PMSM

PART – B (5 × 16 = 80 Marks)

11. (a) Explain the construction and operation of Axial and Radial flux motors with neat diagram. (16)

OR

- (b) (i) Derive the expression for the torque equation for the synchronous reluctance motor. (8)
(ii) Investigate the performance of the synchronous reluctance motor with neat phasor diagram. (8)

12. (a) Construct and evaluate the operation of single stack and multi-stack stepper motor with a neat diagram. (16)

OR

- (b) Compare the static and dynamic characteristics of stepper motor with necessary diagrams. (16)

13. (a) Explain with a neat diagram the constructional details and operation of rotary switched reluctance motors. (16)

OR

- (b) (i) Explain with a neat circuit any two configurations of power converters used for the control of switched reluctance motor. (12)
(ii) State the advantages of sensorless operation. (4)

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 2.5Ω 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 PMSM motor has torque constant 0.12 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 2 V. (8)

15. (a) Write short notes on :

- (i) Volt-ampere requirements in PMSM Motor. (8)
(ii) Torque/speed characteristics in PMSM Motor. (8)

OR

- (b) Derive EMF and torque equations of permanent magnet synchronous motor. (16)