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**Question Paper Code : 71635**

M.E. DEGREE EXAMINATION, JUNE/JULY 2013.

Second Semester

Power Electronics and Drives

PE 9223/PE 923/10233 PSE 41 — SPECIAL ELECTRICAL MACHINES

(Common to M.E. Power Management, M.E. Electrical Drives and Embedded Control and M.E. Power Systems Engineering)

(Regulation 2009/2010)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Draw two phase synchronous reluctance motor with unipolar current mode control with ideal current waveforms.
2. Define synchronous reluctance.
3. Define step angle and slewing in stepping motor.
4. Draw the block diagram of the drive system of a stepping motor.
5. What is the basic principle of operation of switched reluctance motor?
6. What are the different types of power controller used for SRM?
7. Write the power input expression for PMSM.
8. What are the torque speed characteristics of PMSM?
9. What is the evolution of BLPMDC motor?
10. What are the classifications of BLPMDC motor?

PART B — (5 × 16 = 80 marks)

11. (a) (i) Explain the construction and working principle of synchronous reluctance motor. (10)
- (ii) Explain with sketch the classifications of synchronous reluctance motor and its applications. (6)

Or

- (b) (i) Derive the torque equations and phasor diagram of synchronous reluctance motor. (10)
- (ii) Explain with sketch construction and working principle of linear induction machines. (6)
12. (a) (i) Explain the construction and working principle of operation of 1-phase ON mode and 2-phase ON mode of Variable reluctance motor. (10)
- (ii) Explain the static and dynamic characteristics of Variable reluctance stepper motor. (6)

Or

- (b) (i) What is the need for suppressor circuits? Explain the different types of suppressor circuits. (10)
- (ii) What are the drawbacks of open loop systems? What is the need for closed loop control of stepper motor? (6)
13. (a) (i) Draw the variation of inductance profile w.r.t. rotor position and derive the static torque in SRM. (10)
- (ii) Explain the speed torque characteristics switched reluctance motor. (6)

Or

- (b) (i) Explain how the effect of saturation improves the efficiency in SRM. (10)
- (ii) Describe microprocessor based control of SRM drive and explain why rotor position sensor is essential for the operation of SRM. (6)
14. (a) (i) Explain the principle of operation of PMSM and Obtain expression for EMF. (8)
- (ii) Draw and explain the phasor diagram of a sinewave motor. (8)

Or

- (b) (i) Obtain expression for torque in PMSM and discuss the current control in PMSM. (10)
- (ii) Describe vectrol control in PMSM. (6)
- 15. (a) (i) Obtain expression torque of PMBLDC motor. (8)
- (ii) Explain the construction of mechanical commutator in a dc motor and explain how the electronic commutator operates in PMBLDC motor. (8)

Or

- (b) (i) Explain rotor Optical position sensors in PMBLDC motor. (8)
  - (ii) Draw and explain the closed loop scheme of a PMBL DC drive with suitable schematic diagram. (8)
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