

Z 6347

M.E. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2006.

Elective

Power Electronics and Drives

PE 1621 — SPECIAL ELECTRICAL MACHINES

(Regulation 2005)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. State the advantages of reluctance motors.
2. What is meant by reluctance torque?
3. Write the torque equation for a switched reluctance motor drive.
4. Draw the general torque-speed characteristics of switched reluctance motor.
5. Give the expressions for the self and synchronous reluctance of permanent magnet synchronous motor.
6. Distinguish between self control and vector control of PMSM.
7. What is optical sensor?
8. Draw the magnetic equivalent circuit of two pole PMBLDC motor.
9. How is the step of permanent magnet stepper motor controlled?
10. What do you understand by full step and half step?

PART B — (5 × 16 = 80 marks)

11. (a) A 3 phase, 230 V, 10 pole star connected reluctance motor has $X_d = 18.5$ ohms and $X_q = 30$ ohms. The armature resistance is negligible. If V/F ratio is maintained constant at the rated value. Determine
 - (i) Torque angle and
 - (ii) Line currentAssume the load torque = 12.5 N-m.

Or

- (b) Describe the construction and principles of operation of synchronous reluctance motors. Draw the relevant characteristics.

12. (a) Draw the cross sectional view of switched reluctance motor and explain the principles of operation.

Or

- (b) Explain how microprocessor can be used to control the switched reluctance motor.
13. (a) Describe the operation of permanent magnet synchronous motor with torque-speed characteristics.

Or

- (b) Explain in detail the vector control of permanent magnet synchronous motor.
14. (a) Discuss the working principle of PMSBLDC motor. What are the advantages of BLDC motors?

Or

- (b) (i) Write short note on multiphase brushless motor. (8)
- (ii) Distinguish between mechanical and electronic commutators. (8)
15. (a) A variable reluctance stepper motor has 3 stages and 6 rotor teeth per stack. The step sequence is as, cs, bs, as..... Find
- (i) the tooth pitch T_P and
- (ii) the step length S_L .

Or

- (b) (i) State the advantages of hybrid stepper motors. (8)
- (ii) Explain the operation of 2 pole 3 stack variable reluctance stepper motor. (8)