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Question Paper Code : 20468

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2018.

Seventh Semester

Electrical and Electronics Engineering

EE 6703 — SPECIAL ELECTRICAL MACHINES

(Regulations 2013)

(Common to PTEE 6703 – Special Electrical Machines for B.E. (Part-Time) Sixth Semester – Electrical and Electronics Engineering – Regulations 2014)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Draw the torque-angle characteristics of synchronous reluctance motor.

2. What is reluctance torque in synchronous reluctance motor?

3. Classify the different types of stepping motors.

4. Define detente torque.

5. What are the types of rotor position sensors in switched reluctance motor?

6. What are the advantages of switched reluctance motor?

7. Why is the PMBLDC motor called electronically commutated motor?

8. Compare conventional DC motor and PMBLDC motor.

9. What are the features of permanent magnet synchronous motor?

10. Draw the phasor diagram of a permanent magnet synchronous motor.

PART B — (5 × 13 = 65 marks)

11. (a) (i) Draw the steady state phasor diagram of synchronous reluctance motor. (6)

(ii) Draw and explain the speed-torque characteristics of synchronous reluctance motor. (7)

Or

(b) Describe the constructional details and working principle of synchronous reluctance motor. (13)

12. (a) Describe the static and dynamic characteristics of stepper motor. (13)

Or

(b) Explain the modes of operation of variable reluctance stepper motor. (13)

13. (a) Explain with a neat sketch, construction and working principle of SRM. (13)

Or

(b) What are the different types of power controllers used for SRM and explain the operation of any two scheme with suitable circuit diagram. (13)

14. (a) Sketch the structure of controller for PMBLDC motor and explain the functions of various blocks. (13)

Or

(b) Derive EMF equation for PMBL square wave DC motor. (13)

15. (a) Explain about self controlled PMSM drive by employing load commutated thyristor inverter. (13)

Or

(b) Explain the microprocessor based control of PMSM with a neat block diagram. (13)

PART C — (1 × 15 = 15 marks)

16. (a) Discuss the applications areas of different special electrical machines? (15)

Or

(b) A stepper motor driven by a bipolar drive circuit has the following parameters:

Winding inductance = 30 mH, rated current = 3A, DC supply = 45 V, total resistance in each phase = 15Ω. When the transistors are turned off, determine (i) the time taken by the phase current to delay to zero and (ii) the proportion of the stored inductive energy returned to the supply. (15)