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<b>Question Paper Code : 70486</b>
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B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2021.

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) —  
Electrical and Electronics Engineering – Sixth Semester (Regulation-2014))

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. What is meant by reluctance torque in synchronous reluctance motor?
2. Write down the applications of synchronous reluctance motor.
3. Draw the equivalent circuit of winding in stepper motor.
4. What are the applications of stepper motor?
5. What are the types of rotor position sensors in switched reluctance motor?
6. What are the advantages of switched reluctance motor?
7. List any four permanent magnet materials.
8. State some important applications of Permanent Magnet Brushless DC Motors.
9. What is the distribution factor in PMSM?
10. Give the difference between SYNREL motor and PM 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) (i) Explain in detail the multi stack construction of stepper motor. (7)  
(ii) Explain the modes of excitation of a stepper motor with neat diagram. (6)

Or

- (b) (i) A stepper motor has resolution of 180 steps/rev. Find the pulse rate required in order to obtain a rotor speed of 2400 rpm. (7)  
(ii) Explain in detail, the static and dynamic characteristics of a stepper motor. (6)

13. (a) (i) Explain with a neat circuit any two configuration of power converters used for the control of SR motor. (10)  
(ii) State the advantages of sensorless operation. (3)

Or

- (b) Draw the variation of inductance with rotor position and explain how static torque is produced in SR motors. (13)

14. (a) (i) Explain the magnetic circuit analysis of permanent magnet brushless DC motor on open-circuit. (8)  
(ii) Derive the EMF equation of permanent magnet brush less DC motor. (5)

Or

- (b) (i) Draw and explain the general structure of a controller for a permanent magnet brush less DC motor. (7)  
(ii) Describe the torque/speed curve of the ideal burshless DC motor. (6)

15. (a) Describe the construction and performance of PMSM with neat diagram. (13)

Or

- (b) Derive the emf and torque equation of a Brushless permanent magnet sine wave DC motor. (13)

PART C — (1 × 15 = 15 marks)

16. (a) (i) Draw a drive circuit for a three phase variable reluctance stepper motor that makes use of two different voltage levels and explain the same with neat graph representing current and voltage. (8)
- (ii) Calculate the step angle of a three phase switched reluctance motor having 8 rotor poles. Also determine the commutation frequency at each phase at the speed of 2400 rpm. For a stepper motor having the same step angle, calculate the number of stator and rotor poles. (7)

Or

- (b) Compare permanent magnet brushless DC motor with permanent magnet synchronous motor based on their performance parameters. (15)
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