

**M.E. DEGREE EXAMINATIONS: NOV/DEC 2010**

Third Semester

**POWER ELECTRONICS AND DRIVES**

PED551: Special Electrical Machines

**Time: Three Hours**

**Maximum Marks: 100**

**Answer ALL Questions:-**

**PART A (10 x 2 = 20 Marks)**

1. Define reluctance torque.
2. List few applications of synchronous reluctance motors.
3. What are the different power controllers used for the control of Switched Reluctance Motors?
4. Write the torque equation of Switched Reluctance Motor.
5. Write the EMF equation of Permanent Magnet Synchronous Motor.
6. What is load commutation?
7. Mention few permanent magnets.
8. Name two rotor position sensors.
9. Define pull-in torque.
10. Draw the dynamic characteristics of stepper motor.

**PART B (5 x 16 = 80 Marks)**

11. a) Explain the constructional details and working principle of synchronous reluctance motor. (16 marks)

**(OR)**

- b) (i) Draw and explain the torque – speed characteristics of synchronous reluctance motor. (8 marks)

- (ii) Draw the phasor diagram of synchronous reluctance motor. (8 marks)

12. a) Explain in detail about the power controllers used for Switched Reluctance Motors.

**(OR)**

- b) Explain the different modes of operation of Switched Reluctance Motors and their current waveforms.

13. a) (i) Explain the principle of operation of Brushless Permanent Magnet Sine Wave motor.  
(8 marks)

(ii) Explain the torque - speed characteristics of Permanent Magnet Synchronous Motor.  
(8 marks)

**(OR)**

b) Explain the self controlled mode of operation of synchronous motor drive employing load commutated thyristor converter.

14. a) Draw the structure of a controller for Permanent Magnet Brushless DC Motor and explain the functions of various blocks.

**(OR)**

b) (i) Compare mechanical commutator with electronic commutator. (8 marks)

(ii) Explain any two rotor position sensors used in Permanent Magnet Brushless DC Motors. (8 marks)

15. a) Discuss in detail about the dynamic characteristics of stepper motor.

**(OR)**

b) (i) What is the required resolution for a stepper motor that is to operate at a pulse frequency of 6000pps and a travel of  $180^\circ$  in 0.025 secs. (8 marks)

(ii) A stepper motor has a step angle of  $2.5^\circ$ . Determine (i) Resolution (ii) number of steps required for the shaft to make 25 revolutions (iii) shaft speed if the stepping frequency is 3600 pps. (8 marks)

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