SATHYABAMA UNIVERSITY
(Established under section 3 of UGC Act, 1956)

Course & Branch: B.E - EEE
Title of the paper: Special Electrical Machines
Semester: V   Max. Marks: 80
Sub.Code: 314507   Time: 3 Hours
Date: 13-11-2008   Session: FN

PART – A   (10 x 2 = 20)
Answer All the Questions

1.   State the principle of vernier motor.

2.   Define reluctance torque.

3.   State any two advantages of variable reluctance motor.

4.   Draw the block diagram of stepper motor.

5.   List the two differences between a stepper motor and switched reluctance motor.

6.   Write the torque equation of switched reluctance motor.

7.   Name the position sensors that are used for PMBLDC motor.

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

9.   How a permanent magnet synchronous motor is started?

10.   What is meant by field oriented control of PM synchronous motor?

PART – B   (5 x 12 = 60)
Answer All the Questions

11.   Draw and discuss the torque – speed characteristics of single phase synchronous reluctance motor.

(or)

12.   Explain in detail the construction and principle of operation of vernier motor.

13. A stepper motor has a step angle of 2.5°. Find resolution, number of steps required for the shaft to make 25 revolutions and shaft speed if stepping frequency is 3600 pulse/sec.

(or)

14. A single stack 3-phase variable reluctance motor has a stepping angle of 15°. Find the number of its stator and rotor poles.

15. A switched reluctance motor with six stator poles and four rotor poles has stator pole arc of 30° and rotor pole arc of 32°. The aligned inductance is 10.7 mH and unaligned inductance is 1.5 mH. Saturation can be neglected. Calculate the instantaneous torque when the rotor is 30° before the aligned position and the phase current is 7 A.

(or)

16. Derive the torque equation and develop the mechanical characteristics of switched reluctance motor.

17. A 3-phase four pole brushless PM motor has 36 stator slots. Each phase winding is made up of three coils per pole with 20 turns per coil. The coil span is seven slots. If the fundamental component of magnet flux is 1.8 mwb, calculate the open circuit phase emf E_g at 3000 rpm.

(or)

18. Derive an expression for permeance coefficient (PC) for PMBLDC motor interms of magnet permeance P_{ms}, rotor leakage per phase P_{rl} and air gap reluctance R_g.

19. Explain the principle of operation of a sine wave PM synchronous machine. Draw its phasor diagram and derive its torque equation.

(or)

20. Discuss PMBLDC and PM synchronous motor with respect to torque / ampere and kVA of converter / kW of power to motor for 4-pole, 3-phase motor system.