A **Reg. No. :** | | | | | | | | | | |

Question Paper Code: 59306

B.E. / B.Tech. DEGREE EXAMINATION, MAY 2022

Elective

Electrical and Electronics Engineering

15UEE906 – SPECIAL ELECTRICAL MACHINES

(Regulation 2015)

Duration: Three hours Maximum: 100 Marks

Answer ALL Questions

PART A - (10 x 1 = 10 Marks)

1. In BLDC motor field winding is kept on _____ CO1- R

   (a) Stator (b) Rotor (c) Can be placed anywhere (d) Absent

2. Typical brushless motor doesn't have _____ CO1- R

   (a) Commutator (b) Permanent magnet (c) Electronic controller (d) Fixed armature

3. In a synchronous motor, the damper winding is provided to CO2- R

   (a) Stabilize rotor motion (b) Suppress rotor oscillations

   (c) Develop starting torque (d) Both b and c

4. Flux density of a permanent magnet synchronous machine has __wave CO2- R

   (a) Square (b) Sine (c) Cosine (d) Triangular

5. A switched reluctance motor differs from a Variable Reluctancestepper motor in the sense that it CO3- R

   (a) Has rotor poles of ferromagnetic material (b) Rotates continuously

   (c) Is designed for open-loop operation only (d) Has lower efficiency

6. Switched reluctance motors are CO3- R

   (a) Singly excited (b) Doubly excited (c) Neither a or b (d) Both a and b

7. The torque exerted by the rotor magnetic field of a PM stepping motor with unexcited stator is called _____torque. CO4- R

(a) Reluctance (b) Detent (c) Holding (d) Both b and c

8. A stepping motor is a_____ device. CO4- R

(a) Mechanical (b) Electrical (c) Analogue (d) Incremental

9. In hysteresis motors, the rotor is made of magnetic material having area of hysteresis loop CO5- R

(a) Negligible (b) Very small (c) Medium (d) Large

10. A few field turns are used in AC series motor in orders to reduce CO5- R

(a) Hysteresis loss (b) Eddy current losses (c) Starting current (d) Reluctance

PART – B (5 x 2= 10 Marks)

11. List four permanent magnet materials. CO1- R

12. Classify permanent magnet synchronous motors. CO2- R

13. List four applications of switched reluctance motor. CO3- R

14. What do you mean by micro-stepping in a stepper motor? CO4- R

15. Draw the torque speed curve for a hysteresis motor. CO5- R

PART – C (5 x 16= 80 Marks)

16. (a) Explain the construction and working principle of square wave permanent magnet brushless dc motor. CO1- U (16)

Or

(b) Develop a closed loop control scheme and explain the control for permanent magnet brushless dc motor. CO1- U (16)

17. (a) Explain the construction and operating principle of a permanent magnet synchronous motor. CO2- App (16)

Or

(b) Draw and Discuss the performance of a permanent magnet synchronous motor with different rotor configurations. CO2- App (16)

18.	(a)	Derive the torque equation and explain how torque is produced in a switched reluctance motor.	CO3- U	(16)
		Or		
	(b)	Explain the performance of any two converter topology for a switched reluctance motor.	CO3- U	(16)
19.	(a)	Describe construction and principle of operation of a variable reluctance stepper motor.	CO4- U	(16)
		Or		
	(b)	Explain the static and dynamic characteristics of a variable reluctance stepper motor.	CO4- U	(16)
20.	(a)	Explain the construction and working principle of Hysteresis motor.	CO5- U	(16)
		Or		
	(b)	Explain the construction and working principle of Linear induction motor.	CO5- U	(16)