KUMARAGURU college of technology
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Register Number:……..…

B.E DEGREE EXAMINATIONS: MAY 2017

(Regulation 2014)

Sixth Semester

ELECTRICAL AND ELECTRONICS ENGINEERING

U14EETE11: Special Electrical Machines

COURSE OUTCOMES

CO1: Describe the principle of operation, constructional features of reluctance motor and brushless dc motor.

CO2: Construct the power circuit and switching circuit of various special electrical machines.

CO3: Distinguish the torque capability and characteristics of electrical machines and choose electrical machine for specified applications.

Time: Three Hours **Maximum Marks: 100**

Answer all the Questions: -

PART A (10 x 1 = 10 Marks)

1. Match list I with list II and select the correct answer using the codes given below. CO1 K1

List I	List II
A. PMBLDC	1. High power drives
B. PMSM	2. Low power drives
C. SRM	3. Computer control system
D. Stepper Motor	4. C-dump circuit

a) 2,1,4,3 b) 1,2,3,4

c) 4,3,2,1 d) 3,4,1,2

2. In synchronous reluctance motor, the rotor has magnetic poles which have a ---------- magnetic reluctance in an axial direction of the magnetic poles. CO1 K2

a) High b) Medium

c) low d) Double

3. Determine the step angle of a four phase stepper motor with 8 stator teeth and 6 rotor teeth. CO1 K1

a) 15^0 b) 30^0

c) 45^0 d) 60^0

4. A stepper motor has a step angle of 3^0 and is driven 3000 rps, find its resolution. CO1 K1

a) 60 b) 120

c) 180 d) 30

5. Consider the following statements for a switched reluctance motor differs from a VR stepper motor in the sense that it CO3 K2

1. has rotor poles of ferromagnetic material
2. rotates continuously
3. is designed for open-loop operation only
4. has lower efficiency

Which of these statements are correct?

a) 1 b) 3&4

c) 1&2 d) 2

6. In switched reluctance motor, the conduction period is also termed as_____. CO2 K1

a) Swell b) Dwell

c) Sag d) excitation

7. In SRM, when air gap is minimum, the reluctance will be minimum, hence inductance will be maximum, so the rate of change of inductance is _____. CO2 K2

a) High b) Low

c) zero d) Medium

8. The two comparators used in the power controllers of PMBLDC motor is _____. CO2 K1

a) Speed, Current b) Speed, voltage

c) Voltage, current d) c dump, current

9. The sensor less detection of the rotor position sensor is also known as _____sensor. CO2 K1

a) Hall effect b) speed

c) Implicit d) Explicit

10. Which of the following motor would suit applications where constant speed is absolutely essential to ensure a consistent product? CO3 K2

a) brushless dc motor b) disk motor

c) permanent-magnet synchronous motor d) stepper motor

PART B (10 x 2 = 20 Marks)

(Answer not more than 40 words)

11. Why synchronous reluctance motor is called so? CO1 K1

12. Define reluctance torque. CO3 K2

13. Name the different types of stepper motor. CO1 K1

14. Mention the applications of stepper motor. CO1 K1

15.	What is the need of power controllers in SRM?		CO2	K2
16.	Mention the applications of SRM.		CO3	K1
17.	Why the PMBLDC motor is called an electronically commutated motor?		CO1	K1
18.	Write down the torque equation of PMBLDC motor.		CO3	K2
19.	What is meant by slotless motor?		CO3	K2
20.	Write down the emf equation of PMSM.		CO3	K1

PART C (5 x 14 = 70 Marks)
Answer any FIVE questions
(Answer not more than 300 words)

Q.No. 21 is Compulsory

21.	Describe the various modes of excitations used in Stepper Motor and draw excitation sequence tables.		CO1	K2
22.	With neat diagram, explain the construction and principle of operation of Synchronous Reluctance Motor.		CO1	K1
23.	With neat diagram, explain the operating modes of following power controllers in SRM. i) Classical converter ii) (n+1) power switching devices for n-phase motor iii) C- dump circuit		CO2	K2
24.	(i) Explain the construction and principle of operation of PMBLDC motor with neat diagram. (ii) Draw and explain the speed-torque characteristics of PMBLDC Motor.	(7) (7)	CO1 CO3	K1 K2
25.	With neat diagram, explain the constructional features and principle of operation of permanent magnet synchronous motor in detail.		CO1	K1
26.	i) With neat diagram, explain the operation of variable reluctance stepping motor. ii) Derive the torque equation of Synchronous Reluctance Motor.	(7) (7)	CO1 CO3	K1 K2
27.	i) Explain the speed-torque characteristics of permanent magnet synchronous motor. ii) Enumerate the applications of permanent magnet synchronous motor.	(10) (4)	CO3 CO3	K2 K1

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