Register Number:……..

KUMARAGURU
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B.E. DEGREE EXAMINATIONS: NOV/DEC 2023

(Regulation 2018)

Seventh Semester

ELECTRICAL AND ELECTRONICS ENGINEERING

U18EET7001**:** Special Electrical Machines

COURSE OUTCOMES

CO1: Understand the construction and principle of operation of different special electrical machines.
CO2: Identify the characteristics of different special electrical machines.
CO3: Analyze the modes of operation of power controllers for special electrical machines.
CO4: Describe the control strategies for special electrical machines.
CO5: Select specific special machine for a particular application.

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

Answer all the Questions:-
PART A (10 x 2 = 20 Marks)
(Answer not more than 40 words)

1.	Compare Axial and Radial Air Gap SynRMs.	CO1	[K_1]
2.	Draw the Speed Torque Characteristics of Synchronous Reluctance Motors.	CO2	[K_1]
3.	A three-phase, three-stack VR stepper motor has 10 rotor teeth. Find its step angle.	CO2	[K_2]
4.	For a three-phase Variable Reluctance Stepper Motor, give the logic sequences for (i) one-phase ON mode (ii) two-phase ON mode.	CO4	[K_2]
5.	Why is Switched Reluctance Motor preferred in adjustable speed drives?	CO5	[K_2]
6.	What are the advantages of Switched Reluctance Motors?	CO1	[K_1]
7.	A Permanent Magnet Brushless DC Motor having a Torque Constant of 0.12 Nm per Amp, is connected to a 48 V DC supply. If the armature resistance per phase is 0.15 Ω, find the Stalling Torque. Neglect other voltage drops.	CO4	[K_2]
8.	Distinguish between Mechanical and Electronic Commutators.	CO3	[K_2]
9.	Write down the EMF Equation for a practical PMSM Motor.	CO3	[K_1]
10.	List the applications of Permanent Magnet Synchronous Motors.	CO5	[K_1]

Answer any FIVE Questions:-
PART B (5 x 16 = 80 Marks)
(Answer not more than 400 words)

11.	Describe the constructional details and working principle of Synchronous Reluctance Motor, with neat sketches.	16	CO1	[K_1]

12.	a)	Sketch the static and dynamic characteristics of Stepper Motor. Explain in detail, each term involved.	8	CO2	[K_2]
	b)	Obtain the expression for Torque developed in a Variable Reluctance Stepper Motor.	8	CO2	[K_2]
13.		You are assigned to design a Power Converter Circuit for a Switched Reluctance Motor, containing 'n' number of Phase Windings. Stating the basic requirements to be satisfied by the converter, explain any three power converter circuits of your choice.	16	CO3	[K_2]
14.	a)	Draw the circuit of Power Controller employed for the Permanent Magnet Brushless DC Motor. Discuss in detail its working to achieve the desired speed and to limit the current within permissible value.	12	CO3	[K_2]
	b)	Highlight the working logic of any one sensor used in the above Power Controller.	4	CO3	[K_1]
15.		Explain the Microprocessor based Control of PMSM with a neat block diagram.	16	CO4	[K_2]
16.		Describe the various Power Driver Circuits used for Stepper Motor Applications, with neat sketches.	16	CO5	[K_2]

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