KUMARAGURU
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B.E. DEGREE EXAMINATIONS: DECEMBER 2022

(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.	Draw the cross section view of synchronous reluctance motor and label its part.	CO1	[K$_1$]
2.	Tabulate the difference between axial and radial air gap motor.	CO1	[K$_1$]
3.	Sketch the torque current characteristics of stepper motor with respect to holding and detente torque.	CO2	[K$_2$]
4.	Point out the difference between single and multi-stack stepping motors	CO2	[K$_2$]
5.	Rotor position sensor is essential for the operation of Switched Reluctance Motor. Why?	CO3	[K$_2$]
6.	List the advantages and disadvantages of the converter circuit with two power semiconductor devices and two diodes per phase SRM.	CO3	[K$_2$]
7.	Why BLPM is called as electronically commutated motor?	CO4	[K$_2$]
8.	State the power converter which is used in PMSM for the control of operation.	CO4	[K$_2$]
9.	In what way PMSM is used in automation industry?	CO5	[K$_2$]
10.	If E-vehicle is made to move in forward and reverse directions and how the rotations of PMBL DC motor is reversed?	CO5	[K$_2$]

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

| 11. | a) | Explain the constructions and working principle of synchronous reluctance motor. | 8 | CO1 | [K$_1$] |
| | b) | Describe the constructional features of axial and radial flux synchronous reluctance motors. | 8 | CO1 | [K1] |

| 12. | a) | Illustrate the operation of variable reluctance type stepper motor with different modes of operation. | 16 | CO2 | [K2] |

| 13. | a) | Enumerate the microprocessor based closed loop operation of Switched reluctance motor | 8 | CO3 | [K2] |
| | b) | Explain with a neat circuit diagram any two configuration of power converters used for the control of switched reluctance motor | 8 | CO3 | [K1] |

| 14. | a) | Derive the EMF and torque equation of brushless DC motor and explain the torque – speed characteristics of permanent magnet synchronous motor | 8 | CO2 | [K2] |
| | b) | Sketch the structure of controller for PMBLDC motor and explain the function of various blocks | 8 | CO4 | [K2] |

| 15. | a) | Derive the expression for power input and torque of a PMSM. Explain how its torque speed characteristics are obtained. | 8 | CO3 | [K2] |
| | b) | With necessary diagrams, discuss about various power controllers used for PMSM. | 8 | CO4 | [K2] |

| 16. | a) | Expound the BLDC motor is used for electric vehicles applications and explain it features and future enhancement design needed. | 16 | CO5 | [K2] |

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