Paper id: 251028

Roll No: | | | | | | | | | | | | |

BTECH
(SEM VI) THEORY EXAMINATION 2024-25
SPECIAL ELECTRICAL MACHINES

TIME: 3 HRS **M.MARKS: 70**

Note: Attempt all Sections. In case of any missing data; choose suitably.

SECTION A

1. **Attempt *all* questions in brief.** **02 x 7 = 14**

Q no.	Question	CO	Level
a.	Enlist the Applications of DFIG.	4	K1
b.	Draw the block diagram of constant power drive. Mark the power flows in it for super-synchronous mode.	3	K2
c.	List the types of motors that exhibit detent torque.	1	K1
d.	Enlist the methods used for rotor position sensing in SRM.	2	K1
e.	Comment on the saliency of Interior and Surface PMSM.	1	K2
f.	Enlist the applications of PMAC and PCB Motors.	4	K1
g.	Write two applications of Universal motor.	4	K1

SECTION B

2. **Attempt any *three* of the following:** **07 x 3 = 21**

a.	Explain the operation of Singly Exited Induction Generator in isolated mode by using its magnetization and torque speed characteristics.	2	K2
b.	Define the resolution in a stepper motor. A stepper motor has a step angle of 1.8°. Find (a) resolution, (b) number of steps required for 50 revolutions and (c) shaft speed in RPM if the stepping frequency is 5000 pulse/sec.	1	K4
c.	Explain the operation ofvarious power electronics converters used to run a switched reluctance motor.	3	K2
d.	Differentiate between the following. 1. Electronic and mechanical commutator. 2. BLDC and Conventional DC Motor	1	K4
e.	Explain the construction and working of 1- phase hysteresis motor. Also Explain the torque speed characteristics.	2	K2

SECTION C

3. **Attempt any *one* part of the following:** **07 x 1 = 07**

a.	Explain the construction and principle of operation of a linear induction motor. Also derive the force expression of LIM.	1	K2
b.	Illustrate the construction and working principle of two-phase servomotor with the help of torque speed characteristics.	2	K2

4. **Attempt any *one* part of the following:** **07 x 1 = 07**

a.	Explain the operation of VRSM based on its all three modes of operations. Also derive the torque equation of VRSM.	3	K2
b.	Develop a control strategy to start and run hybrid stepper motor(HSM)using a microprocessor. Control Block diagram and Flow chart of the process must bedrawn.	3	K4

5. **Attempt any *one* part of the following:** **07 x 1 = 07**

a.	Explain all the design constraints ofstator pole arc and rotor tooth arc in a switched reluctance motor.	1	K2

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b.	Draw and explain the following characteristics with reference to SRM
	    a. *Current*vs *rotorangle* curve for all the speeds.
	    b. *Torque*vs *rotor position* curves for all the speeds.
	    c. Torque speed characteristics
		2	K2

6.	**Attempt any *one* part of the following:**		**07 x 1 = 07**

a.	Explain the operation of Six pulse BLDC Motor. A BLDC motor has a no-load speed of 6000 rpm when connected to 120V DC source. Armature resistance is 2.5 ohm. Find the speed when it is supplied with 60 V and developing a torque of 0.5 N-m. The no load current is 1 A.	2	K4
b.	Explain the Vector control of PMSM. Draw related block and Phasor diagrams.	3	K2

7.	**Attempt any *one* part of the following:**		**07 x 1 = 07**

a.	A universal motor takes 1 A from 220 V DC supply while running at 2000 rpm. Find the speed and power factor when it is connected to 230 V, 50 Hz supply drawing the same current. The total resistance and inductance are 20 ohm and 0.4 H, respectively.	2	K4
b.	Explain the construction and working of 1- phase repulsion motor.	1	K2