



Roll No:

BTECH

(SEM. VI) THEORY EXAMINATION 2025-26

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.	Differentiate between start-stop mode and slewing mode.	3	K4
b.	Draw the block diagram of constant torque drive. Mark the power flows in it for sub-synchronous mode.	1	K2
c.	Draw speed torque characteristics of induction generator.	2	K1
d.	Explain the condition for which SRM will exhibit negative torque.	2	K2
e.	Write the two disadvantages of permanent magnet motors.	4	K1
f.	State any two reasons why the BLDC motor has gained increased use in household applications	4	K1
g.	Specify the typical range of the brush shift angle (in electrical degrees) required for optimal operation of a repulsion motor.	2	K2

SECTION B

2. Attempt any *three* of the following:

07 x 3 = 21

a.	Explain the operation of Doubly Fed Induction Generator (DFIG) with reference to wind turbines using suitable block diagrams and characteristics.	4	K2
b.	Explain the construction and working of multi-stack variable reluctance stepper motor.	1	K2
c.	Draw the block diagram of a SRM Drive. Explain its component.	3	K2
d.	Explain the operation of six pulse BLDC motor. Also, Draw the current EMF and switching waveforms.	2	K2
e.	Explain the construction and working of 1- phase repulsion motor. Also Explain the torque speed characteristics.	1	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 double-sided linear induction motor (DSLIM). Also comment on the transverse edge effects in LIM.	1	K2
b.	Explain, why inertia is an important factor in servomotors. How it is reduced in AC servomotors.	1	K2

4. Attempt any *one* part of the following:

07 x 1 = 07

a.	A 3-stack VRSM has 12 poles on each of the stator and rotor stacks. The motor is built such that rotor poles of each stack are aligned. (i) Calculate the angular displacement between stator stacks and the step angle. (ii) Calculate the frequency of phase currents required to achieve a rotor speed of 1200 RPM.	3	K3
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b.	Define the following with reference to a stepper motor: (i)Stepping rate (ii)Step Angle (iii)Slew rate (iv)Pull-in torque (v)Microstepping	3	K2
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5. Attempt any one part of the following:**07 x 1 = 07**

a.	Derive the torque expression of a Switched reluctance motor. Explain the operation of SRM based on its $L-\theta$ profile.	2	K3
b.	Justify the following statements using appropriate theories/derivations/characteristics (i) "SRM is suitable for traction applications", (ii) "SRM operation needs a lot of reactive power".	4	K4

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

a.	Derive the EMF and torque equation of BLDC motor in 120 degree mode of operation	3	K3
b.	Explain the working principle of permanent magnet synchronous generator. Also draw its equivalent circuit and Phasor diagram.	3	K2

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

a.	Explain the working principle of 1-phase reluctance motor. Also draw its various characteristics.	1	K2
b.	Explain the construction and working of 1- phase universal motor. Why changes are needed in DC series motor to operate it on AC supply.	1	K2