Reg. No.															

Question Paper Code	14154

M.E. / M.Tech. - DEGREE EXAMINATIONS, NOV / DEC 2025

First Semester

M.E. - Power Electronics and Drives

24PPEPC105 - SPECIAL MACHINES AND CONTROLLERS

Regulations - 2024

Duration: 3 Hours | Max. Marks: 100

PART - A (MCQ) (10 × 1 = 10 Marks)

Answer ALL Questions

		Marks	K – Level	CO
1.	In a permanent magnet DC motor, the field flux is: (a) Constant (b) Proportional to armature current (c) Inversely proportional to speed (d) Depends on armature resistance	1	K1	CO1
2.	Which of the following control methods is used for PMDC motor speed? (a) Field control (b) Armature voltage control (c) Shunt field control (d) Series field control	1	K2	CO1
3.	The torque developed in a Permanent Magnet Synchronous Motor (PMSM) is due to: (a) Induction (b) Eddy Currents (c) Hysteresis (d) Interaction of stator current and rotor flux	1	K2	CO2
4.	The digital controller in PMSM performs: (a) Frequency control only (b) Torque and flux control using DSP (c) Speed measurement only (d) Voltage rectification	1	K2	CO2
5.	In anSwitched Reluctance Motor (SRM), both stator and rotor have: (a) Windings (b) Laminations only (c) Salient poles (d) Smooth poles	1	K1	CO3
6.	The power converter used in SRM drive is generally a: (a) Two-quadrant converter (b) Asymmetric half-bridge converter (c) Diode bridge (d) Full-wave rectifier	1	K2	CO3
7.	The step angle of a stepper motor depends on: (a) Rotor and stator pole numbers (b) Supply voltage (c) Frequency of pulses (d) Armature resistance	1	K2	CO4
8.	The closed-loop control of stepper motor is used to: (a) Reduce step angle (b) Improve position accuracy and prevent missed steps (c) Increase torque ripple (d) Limit speed	1	K2	CO4
9.	A hysteresis motor runs at (a) Sub-synchronous speed (b) Variable speed (c) Synchronous speed (d) Super-synchronous speed	1	K1	CO5
10.	An AC series motor is essentially a (a) Shunt motor (b) Universal motor (c) Synchronous motor (d) Induction motor	1	K1	CO5

PART - B (12 × 2 = 24 Marks)

Answer ALL Questions

		Marks	K – Level	CO
11.	List the advantages of permanent magnet motors.	2	K1	CO1
12.	Explain why the open-circuit characteristic of a Permanent Magnet DC (PMDC) generator is almost a straight line.	2	K2	CO1
13.	Define a Permanent Magnet Synchronous Motor (PMSM).	2	K1	CO2
14.	Why does the synchronous reluctance motor have no starting torque in single-phase supply?	2	K1	CO2
15.	List two common applications of Switched Reluctance Motor (SRM).	2	K1	CO3
16.	What is the role of rotor position sensors in SRM?	2	K1	CO3
17.	Mention the main types of stepper motors.	2	K1	CO4
18.	How micro stepping improves smoothness in stepper motor motion?	2	K1	CO4

19.	Draw the torque–speed characteristic of a hysteresis motor.	2	K1	CO5
20.	How can direction of motion be reversed in a linear motor?	2	K1	CO5
21.	Compare open-loop and closed-loop control of stepper motors.	2	K2	COx
22.	List the types of converters used in SRM drives.	2	K1	COx

PART - C (6 × 11 = 66 Marks)

Answer ALL Questions

23.	a)	Explain how the interaction between the armature current and the permanent magnetic field governs the operation in a Permanent Magnet DC motor using a neat diagram.	11	K2	CO1
		OR			
	b)	Demonstrate how speed can be controlled using armature voltage control of PMDC motor and show the EMF and torque equations of PMDC motor.	11	K2	CO1
24.	a)	Analyze the concept of the phasor diagram in PMSM and draw the phasor diagram under load and no-load conditions.	11	K3	CO2
		OR			
	b)	Develop the constructional features of synchronous reluctance motor with neat diagram discuss the working principle and list the advantages and disadvantages.	11	K3	CO2
25.	a)	Demonstrate the torque–speed characteristics of an SRM for its different operating regions and evaluate its effects on overall efficiency of the motor.	11	K2	CO3
		OR			
	b)	Explain the performance of an SRM under different control strategies: hysteresis current control and PWM control.	11	K2	CO3
26.	a)	Apply the concept of reluctance principle in stepper motor and discuss the construction features and operation of variable reluctance stepper motor.	11	K3	CO4
		OR			
	b)	Derive the stepping angle of stepper motor and solve for the step angle if it has 8 stator poles and 50 rotor teeth and number of steps per revolution.`	11	K3	CO4
27.	a)	Explain in detail about the construction, principle and operation of hysteresis motor and also mention its applications.	11	K2	CO5
		OR			
	b)	Explain the working principle of linear motors and classify the types. Also List the advantages and disadvantages.	11	K2	CO5
28.	a)	Explain the construction and working principle of hybrid stepper motor with neat diagrams.	11	K2	CO5
		OR			
	b)	Demonstrate the construction and working principle of repulsion motor in detail.	11	K2	CO4