B.E. / B.Tech. - DEGREE EXAMINATIONS, APR / MAY 2025
Fifth Semester
Mechanical and Automation Engineering
20EEPW501 - ELECTRICAL DRIVES AND ACTUATORS WITH LABORATORY
Regulations - 2020

Duration: 3 Hours   Max. Marks: 100

PART - A (MCQ) (10 × 1 = 10 Marks)
Answer ALL Questions

		Marks	K – Level	CO
1.	What is the primary function of a MOSFET in a circuit?	1	K1	CO1
	(a) To store energy (b) To switch and amplify signals			
	(c) To limit current (d) To measure voltage			
2.	Which circuit is used to protect against voltage spikes in switching devices?	1	K1	CO1
	(a) Driver circuit (b) Snubber circuit (c) Commutation circuit (d) Triggering circuit			
3.	Which equation represents the relationship between torque and load in a motor?	1	K1	CO2
	(a) Load = Torque / Speed (b) Torque = Power / Speed			
	(c) Power = Torque × Speed (d) Speed = Torque / Power			
4.	Which of the following factors affects the acceleration of a motor?	1	K1	CO2
	(a) Load inertia (b) Power supply frequency (c) Motor voltage (d) Ambient temperature			
5.	Which of the following is a typical application of a Brushless DC (BLDC) motor?	1	K1	CO3
	(a) Electric vehicles (b) Induction heating (c) Household light bulbs (d) Air conditioners			
6.	Relationship between speed and torque in a DC motor is	1	K1	CO3
	(a) Speed is directly proportional to torque.			
	(b) Speed is inversely proportional to torque.			
	(c) Speed and torque are independent of each other.			
	(d) Torque is constant while speed varies.			
7.	If a stepper motor has 200 steps per revolution, what is the step angle?	1	K1	CO4
	(a) 1.8 degrees (b) 2 degrees (c) 0.5 degrees (d) 5 degrees			
8.	What type of drive circuit is typically used to control a stepper motor?	1	K1	CO4
	(a) Simple resistor circuit (b) H-Bridge circuit (c) Chopper drive circuit (d) Series circuit			
9.	The primary function of a Variable Frequency Drive (VFD) is to:	1	K1	CO5
	(a) Increase torque at constant speed (b) Control the speed of an AC motor			
	(c) Convert AC to DC (d) Reduce power factor			
10.	A key advantage of AC servo drives over DC servo drives is:	1	K1	CO5
	(a) Simplicity in control circuits (b) Higher efficiency and reliability			
	(c) Lower cost (d) Less maintenance required			

PART - B (12 × 2 = 24 Marks)
Answer ALL Questions

		Marks	K – Level	CO
11.	What are the main characteristics of a TRIAC?	2	K1	CO1
12.	Recall the purpose of commutation in switching circuits.	2	K1	CO1
13.	List the advantages of GTO over SCR.	2	K1	CO1
14.	List out the factors influencing the selection of a motor for specific applications.	2	K1	CO2
15.	Relate the equation for steady-state stability of a motor in terms of load torque and developed torque.	2	K2	CO2
16.	Define Drive.	2	K1	CO2
17.	A BLDC motor generates an EMF of 200 V when running at 1500 RPM. Find the back EMF.	2	K1	CO3

K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze; K5 – Evaluate; K6 – Create

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18. What is the principle of operation of a servomotor?	2	K1 CO3
19. List any two key applications of modern stepper motors in automation.	2	K1 CO4
20. Compare open-loop and closed-loop control in stepper motors.	2	K2 CO4
21. Outline the basic components used in an AC servo drive system.	2	K2 CO5
22. Recall the significance of feedback in the operation of AC servo drives used for motion control.	2	K1 CO5

PART - C (6 × 11 = 66 Marks)
Answer ALL Questions

23.	a)	Explain in detail about the switching characteristics of IGBT.	11	K2 CO1
		OR		
	b)	Explain in detail about the switching characteristics of TRIAC.	11	K2 CO1
24.	a)	Summarize a comprehensive control strategy for electric drives that incorporates different modes of operation (acceleration, deceleration, braking and constant speed).	11	K2 CO2
		OR		
	b)	Illustrate mathematical equations governing DC motor load dynamics and also classify different load torque.	11	K2 CO2
25.	a)	Explain the different types of DC motors based on their principles of operation.	11	K2 CO3
		OR		
	b)	Outline the speed-torque relationship of a DC motors.	11	K2 CO3
26.	a)	Illustrate the constructional details and working of any one type of stepper motor.	11	K2 CO4
		OR		
	b)	Interpret the drive circuits used for stepper motors.	11	K2 CO4
27.	a)	Explain the constructional features and principle of operation of PMSM.	11	K2 CO5
		OR		
	b)	Explain the operational mechanics of linear motors in magnetic levitation (maglev) trains.	11	K2 CO5
28.	a) (i)	Outline a simple closed loop control of a stepper motor with neat diagram.	6	K2 CO4
	(ii)	Summarize about VFD drives and its importance.	5	K2 CO5
		OR		
	b) (i)	Explain in detail about Modern Stepper Motors.	6	K2 CO4
	(ii)	Summarize about AC servo motor drives.	5	K2 CO5