Reg. No.															

Question Paper Code	12686

M.E. / M.Tech. - DEGREE EXAMINATIONS, APRIL / MAY 2024

Second Semester

M.E. - Power Electronics and Drives

20PPEPC202 - SOLID STATE DC DRIVES

Regulations - 2020

Duration: 3 Hours | Max. Marks: 100

PART - A (10 × 2 = 20 Marks)

Answer ALL Questions

		Marks	K – Level	CO
1.	What are the advantages of electrical drives?	2	K1	CO1
2.	Compare the constant torque and constant power operation of the DC motor.	2	K2	CO1
3.	What is phase control? Mention the performance parameters of single phase converters.	2	K1	CO2
4.	Write the importance of freewheeling diode in the converter circuits.	2	K1	CO2
5.	How to implement braking in DC controlled drives?	2	K1	CO3
6.	Draw the diagram of class E chopper controlled drive.	2	K2	CO3
7.	Find the key considerations when modeling the power converters using a linear transfer function approach.	2	K1	CO4
8.	What are the advantages and disadvantages of using transfer function models in the analysis and design of drive systems and power converters?	2	K1	CO4
9.	List the advantages and limitations of using a PLL-based control system for DC drives.	2	K1	CO5
10.	Enlist the sensing and feedback elements used in the DC drives.	2	K1	CO5

PART - B (5 × 13 = 65 Marks)

Answer ALL Questions

			Marks	K – Level	CO
11.	a)	Explain Ward-Leonard speed control of dc motor with neat sketch.	13	K2	CO1
		OR			
	b)	Describe four quadrant operation of dc motor drive.	13	K2	CO1
12.	a)	A separately excited dc motor operating from a single phase half controlled bridge at a speed of 1400rpm has an input voltage of 330sin314t and a back emf of 80v.The SCRs are fired symmetrically at α=30 in every half cycle. The armature has a resistance of 4Ω. Calculate the average armature current and the motor torque.	13	K3	CO2
		OR			
	b)	Demonstrate the single phase fully controlled rectifier fed dc separately excited motor with relevant diagrams.	13	K3	CO2

13.	a)	Outline the Braking mode of operation of two quadrant class B chopper.	*13*	*K3*	*CO3*
		OR			
	b)	Illustrate the operation of class D chopper controlled DC Separately excited motor with waveforms.	*13*	*K3*	*CO3*
14.	a)	Derive the transfer function of a separately excited dc motor.	*13*	*K3*	*CO4*
		OR			
	b)	Design the current controller of closed loop control system of dc separately excited dc motor.	*13*	*K3*	*CO4*
15.	a)	Draw the program flow chart of the constant horse power micro computer control of dc drive.	*13*	*K2*	*CO5*
		OR			
	b)	Discuss the challenges and considerations involved in implementing a PLL-based control system for DC drives in real-world applications. Consider issues such as hardware implementation, signal conditioning, and noise rejection.	*13*	*K2*	*CO5*

PART - C (1 × 15 = 15 Marks)

16.	a) i)	Obtain the linear transfer function model of the power converter.	*7*	*K2*	*CO4*
	ii)	Compare different current sensing techniques, such as shunt resistors, Hall effect sensors, and current transformers. Show their advantages, disadvantages, and suitability for different motor types.	*8*	*K2*	*CO5*
		OR			
	b) i)	Explain the speed detection in closed control of DC drive	*7*	*K2*	*CO4*
	ii)	Make use of the effect of PLL parameters, such as loop bandwidth and phase detector gain, to find the performance of a micro-computer controlled DC drive.	*8*	*K2*	*CO5*