Reg. No.												

Question Paper Code	12195

B.E. / B.Tech - DEGREE EXAMINATIONS, NOV / DEC 2023

Sixth Semester

Electrical and Electronics Engineering

20EEPC601 - SOLID STATE DRIVES AND CONTROL

(Regulations 2020)

Duration: 3 Hours Max. Marks: 100

PART - A (10 × 2 = 20 Marks)

Answer ALL Questions

		Marks, K-Level, CO
1.	What are all the conditions to be satisfied for the regenerative braking operation to take place?	*2,K1,CO1*
2.	Classify mechanical loads based on their speed torque characteristics.	*2,K1,CO1*
3.	What causes poor input power factor in phase controlled DC drives?	*2,K2,CO2*
4.	State the conditions for a continuous current conduction mode for DC motor.	*2,K1,CO2*
5.	Give the expression for torque of a static rotor resistance controlled three phase induction motor.	*2,K1,CO3*
6.	Why low frequency operation of V/f control is not preferred?	*2,K2,CO3*
7.	What happens to the stator current of a synchronous motor when V/f is kept constant ?	*2,K2,CO4*
8.	Give any two applications of synchronous motor drives.	*2,K1,CO4*
9.	What are the functions of feedback loops in an electrical drive?	*2,K2,CO5*
10.	List out the factors concerned with selection of converters.	*2,K1,CO5*

PART - B (5 × 13 = 65 Marks)

Answer ALL Questions

11.	a)	Derive the equations governing motor load dynamics from the basic principles.	*13,K2,CO1*
		OR	
	b)	Discuss in detail about steady state stability considerations in an electrical drive.	*13,K4,CO1*
12.	a)	Explain in detail the working of a multi quadrant control of chopper fed DC series motor.	*13,K2,CO2*
		OR	
	b)	A 230 V, 1100 rpm, 220 Amps separately excited DC motor has an armature resistance of 0.02 Ohm. The motor is fed from a chopper, which provides both motoring and braking operations. Calculate :	*13,K5,CO2*

(a) The duty ratio of chopper for motoring operation at rated torque and 400 rpm.
(b) The maximum permissible motor speed obtainable without field weakening, if the maximum duty ratio of the chopper is limited to 0.9 and the maximum permissible motor current is twice the rated current.

13. a) Explain using a diagram the working of a static scherbuis system. Show that it can operate in the synchronous, sub synchronous and super synchronous ranges. Bring out its advantages. *13,K1,CO3*

OR

b) A three phase star connected 60 Hz, 4 pole induction motor has following parameters for equivalent circuit Rs = Rr' = 0.024 Ohm and Xs = Xr' = 0.12 Ohm. The motor is controlled by variable frequency control with constant (V/F) ratio for operating frequency of 12 Hz. Calculate : *13,K5,CO3*
(a) The breakdown torque as a ratio of its value at the rated freq. for both motoring and braking.
(b) The starting torque and rotor current in terms of their values at the rated frequency.

14. a) Describe the speed control of a VSI fed synchronous motor drive. *13,K3,CO4*

OR

b) Explain the operation of a 'power factor control' based self-controlled synchronous motor drive. *13,K4,CO4*

15. a) Explain the operation of closed loop DC motor control with current and speed feedback. *13,K2,CO5*

OR

b) Derive the transfer function of DC motor-load with converter fed armature voltage control. *13,K2,CO5*

PART - C (1 × 15 = 15 Marks)

16. a) (i) Explain the operation of the two quadrant chopper fed DC drive system. *7,K2,CO2*
(ii) Explain the stator voltage control of Induction Motor and how will you obtain the same using the AC voltage controller. *8,K2,CO5*

OR

b) (i) A 220 volt,1500rpm,10A separately excited dc motor is fed from a single phase fully controlled rectifier with a an ac source voltage of 230 volt,50Hz,R_a=2 ohms. Conduction can be assumed to be Continuous. Calculate firing angles for rated motor torque and (-1000) rpm. *7,K3,CO2*
(ii) Explain the operation of VSI fed Induction Motor drive. *8,K2,CO5*