Reg. No.																

Question Paper Code	14376

B.E. / B.Tech. - DEGREE EXAMINATIONS, APRIL / MAY 2026

Sixth Semester

Electrical and Electronics Engineering

20EEPC601 - SOLID STATE DRIVES AND CONTROL

Regulations - 2020

Duration: 3 Hours | Max. Marks: 100

PART – A (i) (MCQ)
(16 × 1 = 16 Marks)
Answer ALL Questions

		Marks	*K – Level*	*CO*
1.	In regenerative braking, the motor acts as a) Transformer b) Generator c) Capacitor d) Inductor	*1*	*K1*	*CO1*
2.	When motor torque equals load torque, the motor operates at a) Acceleration state b) Deceleration state c) Equilibrium point d) Overload condition	*1*	*K2*	*CO1*
3.	The fundamental equation governing motor load dynamics is a) $T = k\phi I_a$ b) $J\frac{d\omega}{dt} = T_m - T_L$ c) $E = V - IR$ d) $P = VI$	*1*	*K2*	*CO1*
4.	In time ratio control of chopper, output voltage depends on a) Resistance b) Duty cycle c) Frequency only d) Load current	*1*	*K3*	*CO2*
5.	If duty cycle of step-down chopper is 0.5 and supply voltage is 200 V, output voltage is a) 50 V b) 100 V c) 150 V d) 200 V	*1*	*K3*	*CO2*
6.	Continuous conduction mode in converter-fed drives means a) Current is zero b) Current flows continuously c) Voltage is zero d) Power is zero	*1*	*K2*	*CO2*
7.	In V/f control, if frequency decreases without changing voltage, flux will a) Increase b) Decrease c) Remain constant d) Become zero	*1*	*K3*	*CO3*
8.	Slip in induction motor is defined as a)Difference between rotor and synchronous speed b) Rotor speed only c) Input voltage d) Torque	*1*	*K2*	*CO3*
9.	Stator voltage control affects a) Rotor resistance b) Speed of induction motor c) Field current d) Armature current	*1*	*K2*	*CO3*
10.	A Current Source Inverter (CSI) mainly maintains a constant a) Voltage b) Frequency c) Current d) Speed	*1*	*K1*	*CO4*

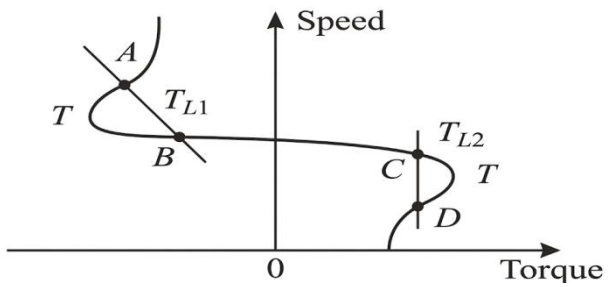
11.	In the self-control of a synchronous motor, rotor position is mainly used for a) Increasing voltage b) Synchronizing the stator field with the rotor c) Reducing losses d) Controlling frequency manually	*1*	*K3*	*CO4*
12.	PWM technique is mainly used to a) Increase noise b) Control voltage and frequency c) Reduce motor speed d) Increase current	*1*	*K1*	*CO4*
13.	A current controller in DC drives is generally designed as a) Integral controller b) Proportional controller c) PI controller d) Derivative controller	*1*	*K3*	*CO5*
14.	In closed loop drive, error signal is: a) Reference only b) Feedback only c) Difference between reference and feedback d) Output only	*1*	*K1*	*CO5*
15.	Transfer function relates: a) Input-output relationship b) Voltage-current c) Speed-torque d) Power-loss	*1*	*K1*	*CO5*
16.	A speed controller in DC drive mainly controls a) Torque b) Voltage c) Speed error d) Flux	*1*	*K3*	*CO5*

PART – A (ii) (Short Answer Questions)
(8 × 3 = 24 Marks)
Answer ALL Questions

17.	Build the basic block diagram of electric drive.	*3*	*K3*	*CO1*
18.	Identify the multi quadrant dynamics in drive characteristics.	*3*	*K3*	*CO1*
19.	Identify semi converter fed DC drive operated in quadrant IV. Justify your answer.	*3*	*K3*	*CO2*
20.	Develop the different control strategies used in chopper.	*3*	*K3*	*CO2*
21.	Identify different methods of speed control of induction motor.	*3*	*K3*	*CO3*
22.	Distinguish self and separate control modes of synchronous motors.	*3*	*K4*	*CO4*
23.	Examine the advantages of constant margin angle control of synchronous motor drive fed by an inverter.	*3*	*K4*	*CO4*
24.	Analyze the advantages of closed loop speed control.	*3*	*K4*	*CO5*

PART - B (Descriptive Answer Questions)
(5 × 12 = 60 Marks)
Answer ALL Questions

25. a) (i) Examine the stability of A,B,C,D *07* *K4* *CO1*



(ii) Categorize the different types of loads based on its characteristics. *05* *K4* *CO1*

OR

	b)	A motor drives two loads one has rotational motion. It is couple to the motor through a reduction gear with a=0.1 and efficiency of 90%. The load has a moment of inertia of 10Kg – m^2 and a torque of 10Nm. The other load has translational motion and consists of 1000kg weight to be lifted up at a uniform speed of 1.5m/s. coupling between this load and the motor has an efficiency of 85%. Motor has inertia of 0.2Kg –m^2 and runs at constant speed of 1420 rpm. Solve for the equivalent inertia referred to the motor shaft and power delivered by the motor.	*12*	*K3*	*CO1*
26.	a)	Develop the condition for continuous conduction mode in a single phase fully controlled converter fed DC motor drive and explain its significance.	*12*	*K3*	*CO2*
		OR			
	b)	A chopper-fed DC drive has input voltage 220 V, output voltage 150 V, load current 10 A, and input current 8 A. Calculate output power, input power, efficiency.	*12*	*K3*	*CO2*
27.	a)	Analyze the v/f control technique utilized for speed regulation in induction motors, incorporating diagrams and waveform illustrations to enhance comprehension.	*12*	*K4*	*CO3*
		OR			
	b)	Evaluate the role of slip power recovery schemes in enabling sub-synchronous speed control of Slip Ring Induction Motors (SRIMs), while also enhancing the system's efficiency.	*12*	*K4*	*CO3*
28.	a) (i)	Develop margin angle control of synchronous motor drive.	*6*	*K3*	*CO4*
	(ii)	Construct and discuss the principle of operation of permanent magnet synchronous motor.	*6*	*K3*	*CO4*
		OR			
	b)	Identify the closed loop control of synchronous motor with neat block diagram.	*12*	*K3*	*CO4*
29.	a)	Build the closed loop operation of armature voltage control method control for DC drive.	*12*	*K3*	*CO5*
		OR			
	b) (i)	Discuss the design procedure for current controller of an electric drive	*6*	*K3*	*CO5*
	(ii)	Identify the factors involved in converter selection and equations involved in controller characteristics	*6*	*K3*	*CO5*