Reg. No.																

Question Paper Code	13160

B.E. / B.Tech. - DEGREE EXAMINATIONS, NOV / DEC 2024

Sixth Semester

Electrical and Electronics Engineering

20EEPC601 - SOLID STATE DRIVES AND CONTROL

Regulations - 2020

Duration: 3 Hours | Max. Marks: 100

PART - A (MCQ) (20 × 1 = 20 Marks)

Answer ALL Questions

		Marks	K – Level	CO
1.	Regenerative braking mode can be achieved in which quadrant (V-I curve)? (a) First (b) Second (c) Third (d) Fourth	1	K1	CO1
2.	Which of the following mentioned is a mode of operation of the electrical drives? (a) Acceleration (b) Decelaration (c) Steady state (d) All of the mentioned	1	K1	CO1
3.	Rolling mills exhibit what type of load torque characteristics? (a) Constant torque characteristics (b) Linearly rising torque characteristics (c) Non-Linearly rising torque characteristics (d) Non-Linearly decreasing torque characteristics	1	K1	CO1
4.	Which of the following braking methods is preffered to conserve energy? (a) Plugging (b) Dynamic (c) Regenerative (d) Rheostatic	1	K1	CO1
5.	Which of the following statements are true with respect to the converter fed dc drives? (a)semiconverter drive operates in one quadrant (b) full-converter drive in two quadrants (c) a dual converter in four quadrants (d) All of the mentioned	1	K1	CO2
6.	During the steady state operation of the separately excited dc motor driven by a rectifier, it is assumed that the Thyristors are ideal switches. What does this infer? (a) Thyristor have no voltage drop when conducting (b) Thyristor have high power dissipation while blocking (c) Thyristor have high voltage drop when conducting (d) Thyristor have high leakage current when blocking	1	K1	CO2
7.	During the steady state operation of the separately excited dc motor driven by a rectifier, which of the following assumptions are true? (a) armature resistance and inductance are constant (b)During a given steady-state operation, the motor speed is constant. (c) ource inductance is negligible. (d) All of the mentioned	1	K1	CO2
8.	The performance of a dc drive is improved when the number of pulses of the rectifier is _____ (a) Increased (b) Decreased (c) Remains same (d) Zero	1	K1	CO2
9.	Force-commutated CSIs need (a) diodes for their commutation (b) Inductors for their commutation (c) Capacitors for their commutation (d) None of the above	1	K1	CO3
10.	In which control, torque of 3 phase induction motor is propotional to square of its supply voltage (a) Change in stator voltage (b) Change in stator frequency (c) V/F control (d) All of the above	1	K1	CO3
11.	Which method is a rotor side speed control of 3 phase induction motor (a) Changing the number of poles (b) Changing V/f ratio (c) Rotor resistance control (d) Changing the stator voltage	1	K1	CO3

12.	By decreasing the supply frequency at constant voltage, the value of air gap flux _____ (a) Decreases (b) Increases (c) Zero (d) Neither increase nor decrease	1	K1	CO3
13.	In self controlled mode, the supply frequency is changed so that the synchronous speed is _____ the rotor speed (a) Equal to (b) Half (c) Double (d) Thrice	1	K1	CO4
14.	Applications of permanent magnet synchronous motors are (a) Fiber spinning mills (b) Cement mills (c) Rolling mills (d) All of the above	1	K1	CO4
15.	Advantage of using permanent magnet in rotor construction is (a) High efficient (b) Field winding copper loss is reduced (c) Less losses (d) Both high efficient and field winding copper loss is reduced	1	K1	CO4
16.	Synchronous motor operates at __ (a) Leading power factor (b) Lagging power factor (c) Unity power factor (d) All of the above	1	K1	CO4
17.	Why armature voltage control method is best suitable for constant torque loads? (a) As voltage remains constant (b) As flux remains constant (c) As speed remains constant (d) As speed remains constant	1	K1	CO5
18.	Which of the following methods belongs to armature voltage control method when the input is AC supply (a) Chopper control (b) Ward-Leonard scheme (c) Transformer with taps and an uncontrolled rectifier bridge (d) All of the mentioned	1	K1	CO5
19.	During the field weakening control method , the power converter is used to control the (a) For controlling the Dc motor speed (b) For controlling the field current (c) For controlling the armature current (d) Not used for all of the mentioned	1	K1	CO5
20.	What happens if the current loop is absent in closed loop control strategy (a)Transient over current produced at the running position (b) Transient over current produced at the starting position (c) Steady state over current produced at the running position (d) Steady state over current produced at the starting position	1	K1	CO5

PART - B (10 × 2 = 20 Marks)

Answer ALL Questions

21.	Specify the functions of power modulator.	2	K1	CO1
22.	Draw the basic block diagram of electric drive.	2	K2	CO1
23.	What is meant by time ratio control?	2	K1	CO2
24.	Can a semi converter fed DC drive operated in quadrant IV? Justify your answer.	2	K1	CO2
25.	Compare CSI fed drives and VSI fed drives.	2	K2	CO3
26.	Discuss different methods of speed control of the induction motor.	2	K1	CO3
27.	Give the advantages and applications of PMSM.	2	K1	CO4
28.	Define torque angle.	2	K1	CO4
29.	Write the transfer function of the converter.	2	K1	CO5
30.	What are the advantages of closed loop speed control?	2	K1	CO5

PART - C (6 × 10 = 60 Marks)

Answer ALL Questions

31.	a)	Explain and derive an equation to find out equivalent Load torque in a motor load system with translational and rotational motion.	10	K2	CO1

OR

	b)	Illustrate the speed – torque conventions in the four quadrant operation of motor driving a hoist load.	*10*	*K2*	*CO1*
32.	a)	Explain the steady state analysis of three phase fully controlled rectifier fed dc drive for motoring and braking operation for a continuous mode with relevant waveforms and characteristics.	*10*	*K2*	*CO2*
		OR			
	b)	Show the steady state analysis of single phase fully controlled rectifier fed dc drive for motoring and braking operation for a continuous mode with relevant waveforms and characteristics.	*10*	*K2*	*CO2*
33.	a)	Explain the speed control scheme of induction motor drive with stator voltage control and state its advantage.	*10*	*K2*	*CO3*
		OR			
	b)	Elaborate on the operational principles behind the static Kramer drive.	*10*	*K2*	*CO3*
34.	a)	Outline the open loop V/F speed control of synchronous motor.	*10*	*K2*	*CO4*
		OR			
	b)	Illustrate the closed loop operation of permanent magnet synchronous motor drive.	*10*	*K2*	*CO4*
35.	a)	Derive the transfer function of the dc motor load system and power converter.	*10*	*K2*	*CO5*
		OR			
	b)	Describe the closed loop speed control of separately excited DC motor by proportional Controller.	*10*	*K2*	*CO5*
36.	a) i)	Draw the block diagram of constant margin angle control of synchronous motor drive and mention its advantage.	*5*	*K2*	*CO4*
	ii)	Write short notes on Converter selection and characteristics.	*5*	*K2*	*CO5*
		OR			
	b) i)	Outline the block diagram of separate controlled mode of operation of synchronous motor.	*5*	*K2*	*CO4*
	ii)	Write short notes on Field weakening mode control.	*5*	*K2*	*CO5*