

SRM VALLIAMMAI ENGINEERING COLLEGE

(Autonomous Institution)

SRM Nagar, Kattankulathur – 603 203

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

QUESTION BANK



VI SEMESTER

PEE204 ELECTRICAL DRIVES

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Prepared by

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SUBJECT & SUBJECT CODE: PEE204 ELECTRICAL DRIVES

SEM / YEAR: VI/ III

UNIT-I DRIVE CHARACTERISTICS

Electric drive – Equations governing motor load dynamics – steady state stability – multi quadrant Dynamics: acceleration, deceleration, starting & stopping – typical load torque characteristics – Selection of motor, modes of operation.

PART-A

Q. No	Questions	BT Level	Competence	CO
1.	What is electric drive?	BTL1	Remembering	CO1
2.	Define load dynamics in electric drives.	BTL2	Understanding	CO1
3.	What is steady-state stability in electric drives?	BTL1	Remembering	CO1
4.	What is multi-quadrant operation in electric drives?	BTL2	Understanding	CO1
5.	Explain the concept of motor acceleration.	BTL1	Remembering	CO1
6.	What is deceleration in electric drive systems?	BTL2	Understanding	CO1
7.	What are typical load torque characteristics?	BTL1	Remembering	CO1
8.	What is the importance of the load inertia in motor dynamics?	BTL2	Understanding	CO1
9.	What are the different types of load torque characteristics?	BTL1	Remembering	CO1
10.	What is regenerative braking in electric drives?	BTL2	Understanding	CO1
11.	What is the significance of time constant in electric drive systems?	BTL1	Remembering	CO1
12.	How does a DC motor operate in different quadrants of the speed-torque plane?	BTL2	Understanding	CO1
13.	What is the difference between continuous and intermittent duty for motors?	BTL1	Remembering	CO1
14.	List the significance of torque-speed characteristics in selecting a motor.	BTL2	Understanding	CO1
15.	What is the importance of speed control in electric drives?	BTL1	Remembering	CO1
16.	Define an electric drive.	BTL2	Understanding	CO1
17.	Define load dynamics in electric drives.	BTL1	Remembering	CO1
18.	State the meaning of steady-state stability in electric drives.	BTL2	Understanding	CO1

19.	Define multi-quadrant operation in drives.		BTL1	Remembering	CO1
20.	Outline the concept of motor acceleration.		BTL2	Understanding	CO1
21.	Define deceleration in an electric drive system.		BTL1	Remembering	CO1
22.	List the typical load torque types.		BTL2	Understanding	CO1
23.	Summarize the role of load inertia in motor behavior.		BTL1	Remembering	CO1
24.	List the various load torque characteristics.		BTL2	Understanding	CO1
25.	Define regenerative braking in electric drives.		BTL1	Remembering	CO1
PART-B					
1.	Derive the dynamic equations of a motor-load system and discuss the factors affecting its transient behavior.	(16)	BTL3	Applying	CO1
2.	Classify electrical loads based on their speed-torque characteristics and present suitable examples for each type.	(16)	BTL4	Analyzing	CO1
3.	Discuss in detail the steady-state stability of the equilibrium point in an electric drive system.	(16)	BTL3	Applying	CO1
4.	Analyze the multi-quadrant operation of a low-speed hoist on the speed-torque plane and illustrate its operating regions.	(16)	BTL4	Analyzing	CO1
5.	Derive the dynamic equations of a motor-load system for both rotational and translational motion.	(16)	BTL3	Applying	CO1
6.	Discuss the different modes of operation of an electric drive with relevant examples.	(16)	BTL4	Analyzing	CO1
7.	Derive the mechanical characteristics of motor-load systems and explain their relevance in drive selection.	(16)	BTL3	Applying	CO1
8.	Discuss the significance of load inertia and friction in determining drive performance and stability.	(16)	BTL4	Analyzing	CO1
9.	Compare constant torque, constant power, and variable torque loads with examples and their applications.	(16)	BTL3	Applying	CO1
10.	Explain regenerative braking in electric drives and analyze its operation in different types of motors.	(16)	BTL4	Analyzing	CO1
11.	Discuss the importance of the time constant in electric drive systems and derive its expression for a motor-load combination.	(16)	BTL3	Applying	CO1

12.	Analyze the four-quadrant operation of a DC motor and illustrate its speed–torque characteristics.	(16)	BTL4	Analyzing	CO1
13.	Compare continuous, intermittent, and short-time duty cycles of motors with suitable examples.	(16)	BTL3	Applying	CO1
14.	Discuss the role of torque–speed characteristics in motor selection for various industrial applications.	(16)	BTL4	Analyzing	CO1
15.	Explain the methods of speed control in electric drives and compare their advantages and limitations.	(16)	BTL3	Applying	CO1
16.	Derive the conditions required for steady-state operation and analyze the stability criteria for electric drives.	(16)	BTL4	Analyzing	CO1
17.	Discuss in detail the acceleration and deceleration processes of electric drives and derive the equations for motor–load dynamics during speed change.	(16)	BTL3	Applying	CO1
18.	Derive the dynamics of motor load system. Classify the electrical loading according to the speed torque characteristics with examples.	(16)	BTL4	Analyzing	CO1

UNIT-II CHOPPER FED DC MOTOR DRIVE

Steady state analysis of the single and three phase converter fed separately excited DC motor drive – continuous and discontinuous conduction – Time ratio and current limit control – four quadrant operations of converter / chopper fed drive.

PART-A

Q. No	Questions	BT Level	Competence	CO
1.	What is continuous conduction in a converter-fed DC motor drive?	BTL1	Remembering	CO1
2.	State the difference between continuous and discontinuous conduction.	BTL2	Understanding	CO1
3.	Define discontinuous conduction in a converter-fed drive.	BTL1	Remembering	CO1
4.	Give the reason for discontinuous conduction in a DC drive.	BTL2	Understanding	CO1
5.	What is time ratio control in a converter-fed DC motor?	BTL1	Remembering	CO1
6.	How does changing the time ratio affect motor speed?	BTL2	Understanding	CO1
7.	Define current limit control in DC motor drives.	BTL1	Remembering	CO1

8.	State the advantage of current limit control in motor protection.		BTL2	Understanding	CO1
9.	What is four-quadrant operation in converter-fed DC drives?		BTL1	Remembering	CO1
10.	Name the four quadrants in the speed–torque plane of a DC motor.		BTL2	Understanding	CO1
11.	What is the significance of a separately excited DC motor in converter-fed drives?		BTL1	Remembering	CO1
12.	How does separate excitation help in controlling motor speed?		BTL2	Understanding	CO1
13.	What is the role of a chopper in a DC motor drive?		BTL1	Remembering	CO1
14.	How does a chopper maintain steady motor speed?		BTL2	Understanding	CO1
15.	What is the effect of load torque on a converter-fed DC motor?		BTL1	Remembering	CO1
16.	How does load torque affect the armature current during steady-state?		BTL2	Understanding	CO1
17.	What is the function of a freewheeling diode in a chopper-fed DC motor drive?		BTL1	Remembering	CO1
18.	How does the freewheeling diode maintain current during the OFF period of the chopper?		BTL2	Understanding	CO1
19.	What is the purpose of time ratio control in DC drives?		BTL1	Remembering	CO1
20.	How does time ratio control maintain constant voltage across the motor?		BTL2	Understanding	CO1
21.	Define duty cycle in chopper-fed DC drives.		BTL1	Remembering	CO1
22.	How does changing the duty cycle affect motor speed in a chopper-fed drive?		BTL2	Understanding	CO1
23.	What is the difference between single-phase and three-phase converter-fed DC motor drives?		BTL1	Remembering	CO1
24.	How does the number of phases in a converter affect the smoothness of motor current?		BTL2	Understanding	CO1
25.	List the operating modes of a four-quadrant DC drive.		BTL1	Remembering	CO1
PART-B					
1.	Explain in detail about the operation and steady state analysis of single phase fully controlled converter fed separately excited DC motor drive in discontinuous mode.	(16)	BTL3	Applying	CO1
2.	Explain in detail about the operation and steady state analysis of single phase fully controlled converter fed separately excited DC motor drive		BTL4	Analyzing	CO1

	in continuous mode.				
3.	Explain the four quadrant operation of chopper fed DC drive.	(16)	BTL3	Applying	CO1
4.	Analyze the multi quadrant operation of chopper fed DC drive.	(16)	BTL4	Analyzing	CO1
5.	Explain different control strategy employed in DC chopper fed DC drive.	(16)	BTL3	Applying	CO1
6.	Explain in detail about the motoring operation and regenerative operation of three phase fully controlled rectifier control of separately excited DC motor.	(16)	BTL4	Analyzing	CO1
7.	Apply the principles of converter operation to describe the behavior of a single-phase fully controlled converter-fed separately excited DC motor operating in discontinuous conduction mode.	(16)	BTL3	Applying	CO1
8.	Examine the continuous conduction mode of a single-phase fully controlled converter-fed separately excited DC motor and analyze how firing angle, supply voltage, and motor back-emf influence steady-state operation.	(16)	BTL4	Analyzing	CO1
9.	Illustrate how a DC motor drive operates in all four quadrants using a chopper and apply the quadrant principles to show motoring and braking actions.	(16)	BTL3	Applying	CO1
10.	Analyze the switching sequences and current flow paths in a multi-quadrant chopper to determine how the DC drive transitions among various operating quadrants.	(16)	BTL4	Analyzing	CO1
11.	Apply different chopper control strategies to show how speed control is achieved in DC drives.	(16)	BTL3	Applying	CO1
12.	Analyze the motoring and regenerative braking operations of a three-phase fully controlled converter driving a separately excited DC motor, focusing on the role of firing angle, power flow direction, and converter voltage polarity.	(16)	BTL4	Analyzing	CO1
13.	A 230 V, 50 Hz single-phase fully controlled converter feeds a separately excited DC motor.		BTL3	Applying	CO1

	The motor has: Armature resistance $R_a=1.2\Omega$, Back emf constant $K_b=0.9V/(rad/s)$, The converter firing angle is $=45^\circ$. Armature current is continuous.				
	(i) Determine the average armature voltage.	(5)			
	(ii) Calculate the steady-state armature current if motor speed is 1200 rpm.	(5)			
	(iii) Determine the motor torque (given torque constant = emf constant).	(6)			
14.	A 230 V, single-phase fully controlled converter feeds a separately excited DC motor operating in discontinuous conduction at a firing angle of 60° . The motor armature circuit has: $R_a=0.8\Omega$, $L_a=20mH$, Speed = 900 rpm, Back emf constant = 1 V/(rad/s), back emf=95V.		BTL4	Analyzing	CO1
	(i) Determine the conduction angle of the current.	(5)			
	(ii) Compute the average armature current.	(5)			
	(iii) Determine how discontinuous conduction affects torque ripple.	(6)			
15.	A 230V, 960 rpm and 200A separately excited dc motor has an armature resistance of 0.02 Ω . The motor is fed from a chopper, which provides both motoring and braking operations. The source has a voltage of 230V. Assuming continuous conduction. Calculate duty ratio of chopper for motoring operation at rated torque and 350 rpm. Calculate duty ratio of chopper for braking operation at rated torque and 350 rpm. Calculate the speed of the motor for motoring operation if the duty ratio of 0.6 and the armature current of 150 A. Calculate if maximum duty ratio of chopper is limited to 0.95 and maximum permissible motor current is twice the rated, calculate maximum permissible motor speed obtainable without field weakening and power fed to the source. Calculate field current as a fraction of its rated value for a speed of 1200 rpm.	(16)	BTL3	Applying	CO1

16.	Explain in detail the steady-state analysis of a single-phase fully controlled converter feeding a separately excited DC motor.	(16)	BTL4	Analyzing	CO1
17.	Discuss the four-quadrant operation of converter/chopper fed DC drive.	(16)	BTL3	Applying	CO1
18.	Describe the current limit control and time-ratio control in converter-fed DC motor drives.	(16)	BTL4	Analyzing	CO1

UNIT-III INDUCTION MOTOR DRIVES

Stator voltage control – energy efficient drive – v/f control – constant air gap flux –field weakening mode – Voltage / current fed inverter – closed loop control-slip power recovery scheme.

PART-A

Q. No	Questions	BT Level	Competence	CO
1.	What are the different methods of speed control of induction motor?	BTL1	Remembering	CO1
2.	Write down the drawbacks of stator voltage control method.	BTL2	Understanding	CO1
3.	Why stator voltage control is suitable for speed control of induction motor in fans and pump drives?	BTL1	Remembering	CO1
4.	Constant torque loads are not suitable for AC voltage controller fed induction motor drive. Why?	BTL2	Understanding	CO1
5.	Give the demerits of CSI fed induction motor.	BTL1	Remembering	CO1
6.	What are the advantages of static rotor resistance control over conventional rotor resistance control?	BTL2	Understanding	CO1
7.	Compare CSI fed drives and VSI fed drives.	BTL1	Remembering	CO1
8.	What is meant by V/F control?	BTL2	Understanding	CO1
9.	What are the three regions in the speed torque characteristics in the induction motor?	BTL1	Remembering	CO1
10.	Mention few general features of induction motor on a CSI.	BTL2	Understanding	CO1
11.	Drawback of an induction motor fed from stepped wave inverter.	BTL1	Remembering	CO1
12.	Induction motor speed control with constant supply voltage and reduced supply frequency is rarely used in practice-Justify.	BTL2	Understanding	CO1
13.	Write down the advantages of stator voltage control method.	BTL1	Remembering	CO1
14.	List the drawbacks of the stator-voltage control method.	BTL2	Understanding	CO1

15.	State the drawbacks of the stator-voltage control method.	BTL1	Remembering	CO1
16.	Discuss why stator-voltage control is suitable for speed regulation in fan and pump drives.	BTL2	Understanding	CO1
17.	Interpret why constant-torque loads are not appropriate for AC-voltage-controller-fed induction motor drives.	BTL1	Remembering	CO1
18.	List the main demerits of a current source inverter (CSI) when used with induction motors.	BTL2	Understanding	CO1
19.	State the advantages of static rotor resistance control compared to conventional rotor resistance control.	BTL1	Remembering	CO1
20.	Illustrate how static rotor resistance control offers advantages over conventional rotor resistance control.	BTL2	Understanding	CO1
21.	List the differences between CSI-fed drives and VSI-fed drives.	BTL1	Remembering	CO1
22.	Interpret the concept of V/F control in induction motor applications.	BTL2	Understanding	CO1
23.	Name the three regions of the speed–torque characteristics of an induction motor.	BTL1	Remembering	CO1
24.	Summarize the general operating features of an induction motor supplied by a CSI.	BTL2	Understanding	CO1
25.	Discuss a drawback of operating an induction motor with a stepped-wave inverter.	BTL1	Remembering	CO1

PART-B

1.	Explain about variable frequency control of induction motor drive.	(16)	BTL3	Applying	CO1
2.	Explain closed loop control for VSI induction motor drives.	(16)	BTL4	Analyzing	CO1
3.	Explain the concept of v/f control scheme.	(16)	BTL3	Applying	CO1
4.	Compare VSI and CSI fed induction motor drive.	(16)	BTL4	Analyzing	CO1
5.	Explain the four modes of operation of a static Sherbius drive.	(16)	BTL3	Applying	CO1
6.	Explain in detail about the static rotor and resistance control in the induction motor.	(16)	BTL4	Analyzing	CO1
7.	Explain in detail about stator voltage control in induction motor drive.	(16)	BTL3	Applying	CO1
8.	Analyze the behavior of an induction motor when its speed is controlled using a variable-frequency drive.	(16)	BTL4	Analyzing	CO1
9.	Explain how closed-loop control improves the performance of a VSI-fed induction motor drive.	(16)	BTL3	Applying	CO1

10.	Analyze how the V/f control scheme ensures constant flux and identify its limitations at low frequencies.	(16)	BTL4	Analyzing	CO1
11.	Apply suitable criteria to compare the performance of VSI-fed and CSI-fed induction motor drives.	(16)	BTL3	Applying	CO1
12.	Analyze the four modes of operation in a static Scherbius drive and determine their impact on power flow and efficiency.	(16)	BTL4	Analyzing	CO1
13.	Show how static rotor resistance control can be used to regulate induction motor torque and speed.	(16)	BTL3	Applying	CO1
14.	A 2.8 kW, 400 V, 50 Hz, 4 pole, 1370 rpm, delta connected squirrel-cage induction following parameters referred to the stator: $R_s= 2\Omega$, $R_r'=5\Omega$, $X_s= X_r'=5\Omega$, $X_m=80\Omega$, Motor speed is controlled by stator voltage control. When driving a fan load it runs at rated speed at rated voltage. Calculate		BTL4	Analyzing	CO1
	(i) Motor terminal voltage, current and torque at 1200 rpm and	(8)			
	(ii) Motor speed, current and torque for the terminal voltage of 300V.	(8)			
15.	A 3-phase, 400 V, 6-pole, 50 Hz, delta-connected, slip-ring induction motor has rotor resistance of 0.2Ω and leakage resistance of 1Ω per phase referred to stator. When driving a fan load it runs at full load at 4% slip. What resistance must be inserted in the rotor circuit to obtain a speed of 850rpm. Neglect stator impedance and magnetizing branch. Stator to rotor turns ratio is 2.2.	(16)	BTL3	Applying	CO1
16.	A 400V, 50Hz, 6-pole, Y-connected wound rotor motor has the following parameter: $R_s= 0.5\Omega$, $R_r'=0.4\Omega$, $X_s= X_r'=1.2\Omega$, $X_m=50\Omega$, stator to rotor turns ratio is 3:5. Motor is controlled by static rotor resistance control. External resistance is chosen such that the breakdown torque is produced at standstill for a duty ratio of zero.	(16)	BTL4	Analyzing	CO1

	Calculate the value of external resistance. How duty ratio should be varied with speed so that the motor accelerates at maximum torque.				
17.	A 3-phase, 400 V, 6-pole, 50 Hz, delta-connected, slip-ring induction motor has rotor resistance of 0.2Ω and leakage resistance of 1Ω per phase referred to stator. When driving a fan load it runs at full load at 5% slip. What resistance must be inserted in the rotor circuit to obtain a speed of 1250rpm. Neglect stator impedance and magnetizing branch. Stator to rotor turns ratio is 2.2.	(16)	BTL3	Applying	CO1
18.	A 400V, 50Hz, 6-pole, Y-connected wound rotor motor has the following parameter: $R_s = 0.5\Omega$, $R_r' = 0.4 \Omega$, $X_s = X_r' = 1.2\Omega$, $X_m = 50\Omega$, stator to rotor turns ratio is 2:4. Motor is controlled by static rotor resistance control. External resistance is chosen such that the breakdown torque is produced at standstill for a duty ratio of zero. Calculate the value of external resistance. How duty ratio should be varied with speed so that the motor accelerates at maximum torque.	(16)	BTL4	Analyzing	CO1

UNIT-IV CONTROL OF SRM AND BLDC MOTOR DRIVES

SRM construction - Principle of operation - Block diagram of Instantaneous Torque control using current controllers and flux controllers. Construction and Principle of operation of BLDC Machine - Block diagram of current controlled Brushless dc motor drive.

PART-A

Q. No	Questions	BT Level	Competence	CO
1.	What is Switched Reluctance Motor drive?	BTL1	Remembering	CO1
2.	List out the types of SRM.	BTL2	Understanding	CO1
3.	Where does an SRM find its application?	BTL1	Remembering	CO1
4.	How is torque distributed in a torque-controlled SRM?	BTL2	Understanding	CO1
5.	State the modes of operation of Switched Reluctance Motor drives.	BTL1	Remembering	CO1
6.	Point out the different power controllers used for the control of Switched Reluctance Motor. (partially within syllabus)	BTL2	Understanding	CO1
7.	Brushless DC Machine (BLDC) – Within Syllabus	BTL1	Remembering	CO1

8.	What is the principle behind the operation of BLDC motors?		BTL2	Understanding	CO1
9.	List out the types of Brushless DC motors.		BTL1	Remembering	CO1
10.	Generalize few applications of BLDC machine.		BTL2	Understanding	CO1
11.	Illustrate the speed feedback of BLDC machine. (fits inside block diagram discussion)		BTL1	Remembering	CO1
12.	Prepare the merits and demerits of Brushless DC machines.		BTL2	Understanding	CO1
13.	Distinguish Sinusoidal and Trapezoidal BLDC machines.		BTL1	Remembering	CO1
14.	Write the difference between SRM and BLDC machine.		BTL2	Understanding	CO1
15.	What is the basic principle of operation of an SRM?		BTL1	Remembering	CO1
16.	Why does the SRM produce torque only when the inductance increases?		BTL2	Understanding	CO1
17.	Mention any two advantages of SRM construction.		BTL1	Remembering	CO1
18.	What is meant by instantaneous torque control in SRM?		BTL2	Understanding	CO1
19.	What is the role of a current controller in SRM torque control?		BTL1	Remembering	CO1
20.	Define flux controller in an SRM drive.		BTL2	Understanding	CO1
21.	Draw the basic block diagram of instantaneous torque control of SRM.		BTL1	Remembering	CO1
22.	State any two features of BLDC motor construction.		BTL2	Understanding	CO1
23.	What is the function of the current controller in a BLDC drive?		BTL1	Remembering	CO1
24.	What is back-EMF in BLDC machines?		BTL2	Understanding	CO1
25.	List any two sensors used in BLDC motor drives.		BTL1	Remembering	CO1

PART-B

1.	Explain the construction and working principle of SRM.	(16)	BTL3	Applying	CO1
2.	Write in detail about a 4-phase SRM drive with a neat diagram.	(16)	BTL4	Analyzing	CO1
3.	Analyze the torque control of SRM and describe the methods used to control torque.	(16)	BTL3	Applying	CO1
4.	Design the current controller for an SRM.	(16)	BTL4	Analyzing	CO1
5.	Write a note on the flux controllers used in SRM.	(16)	BTL3	Applying	CO1
6.	Explain the Switched Reluctance Motor drives with modes of operation and closed-loop speed control.	(16)	BTL4	Analyzing	CO1
7.	Explain the torque–speed characteristics of SRM.	(16)	BTL3	Applying	CO1
8.	Derive the voltage and torque expressions of a	(16)	BTL4	Analyzing	CO1

	switched reluctance machine.				
9.	Write the constructional details and working principle of BLDC machine.	(16)	BTL3	Applying	CO1
10.	Examine the current sensing method used in PMBLDC drive.	(16)	BTL4	Analyzing	CO1
11.	Differentiate sinusoidal and trapezoidal type brushless DC motors.	(16)	BTL3	Applying	CO1
12.	Elucidate the brushless DC motor drive fed from a current-regulated VSI.	(16)	BTL4	Analyzing	CO1
13.	Investigate the current-controlled operation of a BLDC drive.	(16)	BTL3	Applying	CO1
14.	Write a note on the power controllers used for BLDC motor and explain the blocks associated in it.	(16)	BTL4	Analyzing	CO1
15.	Explain the construction and working principle of SRM.	(16)	BTL3	Applying	CO1
16.	Explain the torque–speed behavior of a Switched Reluctance Motor (SRM).	(16)	BTL4	Analyzing	CO1
17.	Derive the mathematical expressions for the voltage and torque of a Switched Reluctance Machine.	(16)	BTL3	Applying	CO1
18.	Describe the construction features and operating principle of a Brushless DC (BLDC) motor.	(16)	BTL4	Analyzing	CO1

UNIT-V DIGITAL CONTROL OF DC DRIVE

Phase Locked Loop and micro-computer control of DC drives – Program flow chart for constant torque and constant horse power operations - Speed detection and current sensing circuits and feedback elements.

PART-A

Q. No	Questions	BT Level	Competence	CO
1.	What is PLL? Where it is used?	BTL1	Remembering	CO1
2.	How is PLL used to control the speed of a DC drive?	BTL2	Understanding	CO1
3.	Draw the basic block diagram of PLL control of a DC drive.	BTL1	Remembering	CO1
4.	Mention the advantages of PLL.	BTL2	Understanding	CO1
5.	Examine the principle of operation of PLL.	BTL1	Remembering	CO1
6.	List any four applications of PLL in DC drives.	BTL2	Understanding	CO1
7.	What are the basic blocks seen in speed control of a DC motor using PLL?	BTL1	Remembering	CO1

8.	How is a Voltage-Controlled Oscillator (VCO) related to PLL? Justify.		BTL2	Understanding	CO1
9.	Define microcomputer.		BTL1	Remembering	CO1
10.	List the applications of microcomputers in electrical drives.		BTL2	Understanding	CO1
11.	Generalize the advantages of using microcomputers.		BTL1	Remembering	CO1
12.	List any four applications of microcomputers used in DC drives.		BTL2	Understanding	CO1
13.	Difference between PLL and microcomputer.		BTL1	Remembering	CO1
14.	Why is digital control necessary?		BTL2	Understanding	CO1
15.	Why is speed detection necessary?		BTL1	Remembering	CO1
16.	Sketch the block diagram of a DC motor with a feedback element.		BTL2	Understanding	CO1
17.	How are current and speed controllers implemented in drives?		BTL1	Remembering	CO1
18.	What are the advantages of closed-loop speed control drives?		BTL2	Understanding	CO1
19.	What is the role of a current controller in the closed-loop control of DC drives?		BTL1	Remembering	CO1
20.	Why must the speed of a DC motor be detected in drive systems?		BTL2	Understanding	CO1
21.	Present the block diagram of a DC motor with a feedback element.		BTL1	Remembering	CO1
22.	How are current and speed controllers realized in DC drive systems?		BTL2	Understanding	CO1
23.	What benefits are obtained by using closed-loop speed control in DC drives?		BTL1	Remembering	CO1
24.	What function does the current controller perform in the closed-loop control of DC motor drives?		BTL2	Understanding	CO1
25.	Why must the speed of a DC motor be detected in drive systems?		BTL1	Remembering	CO1

PART-B

1.	How does a phase-locked loop (PLL) control the speed of a DC motor?	(16)	BTL3	Applying	CO1
2.	Construct the block diagram of a PLL-based DC motor control system and discuss its operation.	(16)	BTL4	Analyzing	CO1
3.	What is the principle behind PLL control in DC drives?	(16)	BTL3	Applying	CO1
4.	Identify the advantages of using PLL-based	(16)	BTL4	Analyzing	CO1

	speed control in DC drives.				
5.	Examine how the PLL technique helps regulate the motor speed in digital DC drives.	(16)	BTL3	Applying	CO1
6.	What are the main functions of a microcomputer in power electronic drive systems?	(16)	BTL4	Analyzing	CO1
7.	Outline the control flow of microcomputer-based DC motor control.	(16)	BTL3	Applying	CO1
8.	Illustrate the microcomputer-based control structure used for a DC drive.	(16)	BTL4	Analyzing	CO1
9.	Analyze a four-quadrant microcomputer-controlled DC drive with a block schematic.	(16)	BTL3	Applying	CO1
10.	Prepare the program flow chart for constant torque and constant horsepower control of a DC motor.	(16)	BTL4	Analyzing	CO1
11.	How does a microcomputer coordinate firing control in thyristor-fed DC drives?	(16)	BTL3	Applying	CO1
12.	How is speed detection performed in digital DC drive systems?	(16)	BTL4	Analyzing	CO1
13.	What are the feedback elements used for speed sensing in DC motors?	(16)	BTL3	Applying	CO1
14.	Compare different speed detection methods used in DC drives.	(16)	BTL4	Analyzing	CO1
15.	Investigate the operation of current sensing circuits used in DC drives.	(16)	BTL3	Applying	CO1
16.	What feedback signals are required for closed-loop control of DC motors?	(16)	BTL4	Analyzing	CO1
17.	Write a brief note on different types of current sensors used in DC drive control.	(16)	BTL3	Applying	CO1
18.	How are current limit and current feedback incorporated in digital DC drives?	(16)	BTL4	Analyzing	CO1

Course Outcome:

Ability to understand drive characteristics.

Ability to understand chopper fed drive.

Ability to understand induction motor drives.

Ability to understand various control strategies and controllers for SRM & BLDC Motor Drive systems.

Ability to design digital control for drives.