

Time: 3 Hours

Max. Marks: 70

PART-A

(Answer all the Questions 10 x 2 = 20 Marks)

- | | | | | | |
|---|---|--|-----|----|----|
| 1 | a | Explain any two advantages of electrical drives. | CO1 | L2 | 2M |
| | b | Explain the fundamental torque equation of an electric drive. | CO1 | L2 | 2M |
| | c | Define continuous and discontinuous conduction in converter-fed DC drives. | CO2 | L2 | 2M |
| | d | Write the average output voltage equation of a single-phase fully controlled bridge converter feeding a separately excited DC motor. | CO2 | L2 | 2M |
| | e | Define one-quadrant, two-quadrant and four-quadrant chopper control of a DC separately excited motor. | CO3 | L2 | 2M |
| | f | What is meant by regenerative braking and dynamic braking in chopper-controlled DC drives? | CO3 | L2 | 2M |
| | g | What is stator voltage control of a three-phase induction motor? How does it affect the speed-torque characteristic? | CO4 | L2 | 2M |
| | h | Why is constant V/f control used in variable-frequency induction motor drives? | CO4 | L2 | 2M |
| | i | Differentiate between separate control and self-control of a synchronous motor. | CO5 | L2 | 2M |
| | j | What is a load-commutated inverter (LCI) fed synchronous motor? | CO5 | L2 | 2M |

PART-B

(Answer all Five Units 5 x 10 = 50 Marks)

UNIT-I

- | | | | | |
|-----------|---|-----|----|-----|
| 2 | Analyze the block diagram of an electric drive and explain how each component contributes to overall system behavior. | CO1 | L4 | 10M |
| OR | | | | |
| 3 | Explain multi-quadrant operation of electrical drives with neat speed-torque characteristics for all quadrants. | CO1 | L2 | 10M |

UNIT-II

- | | | | | |
|---|--|-----|----|-----|
| 4 | A single Phase semi-converter is controlling a separately excited DC Motor field. Being controlled by the semi converter, its current is set to the maximum possible value. The field circuit inductance is enough to maintain the armature and field current continuous. The Field resistance = 190 Ω, Armature resistance = 0.5 Ω, Motor voltage constant = 0.8 V/A-rad-s, Load Torque = 50 N-m, Speed = 1400 RPM, Input AC Supply = 230 V, 50 Hz. Obtain the field current and the triggering angle of the converter in the armature circuit. | CO2 | L3 | 10M |
|---|--|-----|----|-----|

OR

- | | | | | |
|---|---|-----|----|-----|
| 5 | Illustrate the operation of a single-phase Full bridge converter feeding a separately excited DC motor for continuous Conduction Mode and Derive the Speed-Torque | CO2 | L4 | 10M |
|---|---|-----|----|-----|

UNIT-III

- | | | | | |
|---|---|-----|----|-----|
| 6 | Explain the control of a separately excited DC motor using a one-quadrant chopper for Motoring Control. | CO3 | L2 | 10M |
|---|---|-----|----|-----|

OR

- | | | | | |
|---|---|-----|----|-----|
| 7 | Describe the operation of a two-quadrant chopper fed separately excited DC motor. | CO3 | L2 | 10M |
|---|---|-----|----|-----|

UNIT-IV

- | | | | | |
|---|---|-----|----|-----|
| 8 | Explain stator variable voltage and variable frequency (V/f) control of an induction motor. | CO4 | L2 | 10M |
|---|---|-----|----|-----|

OR

- | | | | | |
|---|--|-----|----|-----|
| 9 | Illustrate the concept of slip speed control of a three-phase induction motor. | CO4 | L2 | 10M |
|---|--|-----|----|-----|

UNIT-V

- | | | | | |
|----|--|-----|----|-----|
| 10 | Explain the separate control and self-control of synchronous motors. | CO5 | L2 | 10M |
|----|--|-----|----|-----|

OR

- | | | | | |
|----|---|-----|----|-----|
| 11 | Explain the operation of a self-controlled synchronous motor using a Voltage Source Inverter (VSI). | CO5 | L2 | 10M |
|----|---|-----|----|-----|

*** END ***