

GUJARAT TECHNOLOGICAL UNIVERSITY**BE - SEMESTER– VI (NEW) EXAMINATION – WINTER 2021****Subject Code:3160919****Date:04/12/2021****Subject Name:Electric Drives****Time:10:30 AM TO 01:00 PM****Total Marks: 70****Instructions:**

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.
4. Simple and non-programmable scientific calculators are allowed.

		MARKS
Q.1	(a) Write emf balance equation and derive torque equation of DC motor.	03
	(b) Discuss armature control method for speed control of DC motor.	04
	(c) Derive basic equations for DC motors. Draw performance characteristics for DC shunt, DC separately excited and DC series motor.	07
Q.2	(a) Discuss operation of chopper controlled separately excited DC motor drive in motoring mode.	03
	(b) Discuss various losses taken place in DC motor drive.	04
	(c) Derive basic modeling of DC motor with necessary assumptions. Draw block diagram from the derived functions.	07
	OR	
	(c) Describe four quadrant chopper controlled operation of DC motor drive with necessary diagram and wave forms.	07
Q.3	(a) How smooth starting is obtained for DC motor using chopper control?	03
	(b) Discuss regenerative braking control of DC separately excited motor using chopper.	04
	(c) Discuss closed loop control of DC motor drive.	07
	OR	
Q.3	(a) Discuss need of various PWM techniques over conventional 180° conduction mode for induction motor drive.	03
	(b) Derive speed controller and current controller design for DC motor drive.	04
	(c) Discuss power electronics based rotor side control of slip ring induction motor.	07
Q.4	(a) Draw equivalent circuit of three phase induction motor with necessary nomenclature.	03
	(b) Discuss stator voltage control method for speed control of induction motor.	04
	(c) Explain SPWM technique for voltage source inverter.	07
	OR	
Q.4	(a) Develop the speed-torque characteristics of induction motor in four quadrants.	03
	(b) Discuss operation of induction motor for fan and pump type load.	04
	(c) Explain Space Vector PWM technique for voltage source inverter.	07

- Q.5** (a) What is above base speed and below base speed operation of the motor? **03**
(b) Discuss effect of variation in rotor resistance on induction motor performance. **04**
(c) Discuss principle of V/f control of induction motor in detail with necessary equation and diagram. **07**

OR

- Q.5** (a) Draw and discuss motor characteristics for constant torque and flux weakening region. **03**
(b) What is slip power recovery? How it can be used for speed control of induction motor? **04**
(c) Explain closed loop Volt/Hz control of induction motor. **07**

GUJARAT TECHNOLOGICAL UNIVERSITY**BE - SEMESTER-VI (NEW) EXAMINATION – SUMMER 2022****Subject Code:3160919****Date:10/06/2022****Subject Name:Electric Drives****Time:10:30 AM TO 01:00 PM****Total Marks: 70****Instructions:**

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.
4. Simple and non-programmable scientific calculators are allowed.

MARKS

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|------------|--|-----------|
| Q.1 | (a) Draw speed torque characteristic of DC separately excited, shunt and series motor with proper labeling. | 03 |
| | (b) Enlist methods for speed control of DC motor. Explain any one in brief. | 04 |
| | (c) Describe four quadrant operation of a dc motor. | 07 |
| Q.2 | (a) Give of comparison between converter fed dc drives and chopper fed dc drives. | 03 |
| | (b) Explain dynamic model of DC motor drive. | 04 |
| | (c) Explain chopper controlled DC shunt motor drive operation for motoring mode and regenerative mode. | 07 |
| OR | | |
| | (c) A dc chopper is used for regenerative braking of a separately excited dc motor. The dc supply voltage is 400 V. The motor has $r_a=0.2 \Omega$, $k_m=1.2\text{V-s/rad}$. The average armature current during regenerative braking is kept constant at 300 A with negligible ripple. For a duty cycle of 60% for a chopper, determine: (a) power returned to the dc supply (b) equivalent load resistance of motor acting as a generator (c) minimum and maximum permissible breaking speeds and (d) speed during regenerative braking. | 07 |
| Q.3 | (a) Draw the circuit and waveform of 1- ϕ dual converter drive for the speed control of separately excited dc motor. | 03 |
| | (b) Explain the closed loop speed control technique for DC motor. | 04 |
| | (c) Discuss chopper controlled Separately excited DC motor drive operation for motoring mode. | 07 |
| OR | | |
| Q.3 | (a) Define the principle of vector control. | 03 |
| | (b) Compare DC Drive with AC Drive. | 04 |
| | (c) Explain closed loop speed control of induction motor using slip control scheme. | 07 |
| Q.4 | (a) Discuss the points to be considered while selecting carrier frequency for inverter. | 03 |
| | (b) Compare VSI with CSI fed induction motor drives. | 04 |
| | (c) Draw and explain block diagram of CSI variable frequency drive with current control. | 07 |

OR

- Q.4** (a) List advantages of V/f control over scalar control. **03**
(b) Discuss effect of various harmonic torques of VSI based induction motor drive. **04**
(c) Explain the feature of PWM inverter fed Induction motor drive. **07**
- Q.5** (a) Explain the effect of non-sinusoidal supply on VSI. **03**
(b) Explain stator voltage control of induction motor. **04**
(c) Explain constant air gap flux control scheme for induction motor drives. **07**

OR

- Q.5** (a) Explain operation of doubly fed induction machine in sub synchronous mode. **03**
(b) Compare scalar control and vector control. **04**
(c) Apply the slip recovery scheme for speed controlling of induction motor drive. **07**
