

**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.

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

- 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**

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**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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|------------|--|-----------|
| <b>Q.1</b> | (a) Draw speed torque characteristic of DC separately excited, shunt and series motor with proper labeling.  | <b>03</b> |
|            | (b) Enlist methods for speed control of DC motor. Explain any one in brief.  | <b>04</b> |
|            | (c) Describe four quadrant operation of a dc motor.  | <b>07</b> |
| <b>Q.2</b> | (a) Give of comparison between converter fed dc drives and chopper fed dc drives.  | <b>03</b> |
|            | (b) Explain dynamic model of DC motor drive.   | <b>04</b> |
|            | (c) Explain chopper controlled DC shunt motor drive operation for motoring mode and regenerative mode.   | <b>07</b> |
| <b>OR</b>  |  |           |
|            | (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. | <b>07</b> |
| <b>Q.3</b> | (a) Draw the circuit and waveform of 1- $\phi$ dual converter drive for the speed control of separately excited dc motor.  | <b>03</b> |
|            | (b) Explain the closed loop speed control technique for DC motor.  | <b>04</b> |
|            | (c) Discuss chopper controlled Separately excited DC motor drive operation for motoring mode.  | <b>07</b> |
| <b>OR</b>  |  |           |
| <b>Q.3</b> | (a) Define the principle of vector control.  | <b>03</b> |
|            | (b) Compare DC Drive with AC Drive.  | <b>04</b> |
|            | (c) Explain closed loop speed control of induction motor using slip control scheme.  | <b>07</b> |
| <b>Q.4</b> | (a) Discuss the points to be considered while selecting carrier frequency for inverter.  | <b>03</b> |
|            | (b) Compare VSI with CSI fed induction motor drives.   | <b>04</b> |
|            | (c) Draw and explain block diagram of CSI variable frequency drive with current control.   | <b>07</b> |

**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**

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