Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–VI (NEW) EXAMINATION – WINTER 2023

Subject Code:3160919 Date:13-12-2023

Subject Name:Electric Drives

Time:02:30 PM TO 05:00 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)**	What is Electric drive? State the advantages of Electric Drives over conventional speed control methods.	**03**
	(b)	Discuss the Field control method for speed control of Separately Excited DC (SEDC) motor.	**04**
	(c)	Explain the principle of V/f control for speed control of three phase induction motor. Analyse motor operation using V/f control for below base speed and above base speed control.	**07**
Q.2	**(a)**	Which are the losses occur in Chopper fed SEDC motor Drive? Also obtain the efficiency equation.	**03**
	(b)	Explain the smooth starting of DC motor using chopper.	**04**
	(c)	Derive the equation showing the relation between speed and torque for SEDC motor. Develop the motor characteristics in four quadrants.	**07**
		OR	
	(c)	Derive the torque equation and develop speed-torque characteristics of three phase induction motor in four quadrant.	**07**
Q.3	**(a)**	Draw the speed-torque characteristics of DC shunt and DC series motor.	**03**
	(b)	Compare: Armature resistance controlled and Chopper controlled SEDC motor drive.	**04**
	(c)	Derive the dynamic model of DC motor with necessary assumptions and obtain the block diagram.	**07**
		OR	
Q.3	**(a)**	What is the condition to operate DC motor in regeneration? Draw the SEDC motor characteristics for regeneration.	**03**
	(b)	Explain the armature voltage control method for speed control of SEDC motor.	**04**
	(c)	Discuss operation of four quadrant chopper controlled Separately Excited DC motor drive with necessary diagram and wave forms.	**07**
Q.4	**(a)**	Draw the speed torque characteristics of induction motor showing the effect of variation in rotor resistance.	**03**
	(b)	If V/f ratio does not maintain constant during speed control, how it affects the induction motor performance?	**04**
	(c)	Discuss the SPWM technique for three phase inverter. How it reduces low order harmonics? Show harmonics spectrum around frequency modulation index.	**07**
		OR	

Q.4	**(a)**	Compare 120° conduction Mode and 180° conduction mode of inverter for induction motor drive.	**03**
	(b)	Explain stator voltage control method for speed control of three phase induction motor.	**04**
	(c)	Explain the Space Vector PWM technique for speed control of three phase induction motor.	**07**
Q.5	**(a)**	Draw characteristics of different types of loads.	**03**
	(b)	Prove that change in rotor resistance does not affect maximum torque.	**04**
	(c)	Discuss closed loop control of DC motor drive. Show significance of outer and Inner loop control for chopper fed SEDC drive.	**07**

OR

Q.5	**(a)**	What is the slip power recovery?	**03**
	(b)	Design the speed controller and current controller for closed loop control of DC motor drive.	**04**
	(c)	Discuss closed loop Volt/Hz control of three phase induction motor with slip speed regulation.	**07**

****