Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

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

Subject Code:3160919 Date:14-07-2023

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)**	Draw torque speed characteristic of separately excited dc motor. Explain how change in armature voltage will cause change in speed of motor.	**03**
	(b)	Compare working of conventional speed control methods with converter based speed control of DC motor on the basis of (i) Range of speed (ii) Efficiency of operation (iii) Possibility of automation (iv) Requirement of space	**04**
	(c)	Draw torque speed characteristic of induction motor. Draw and Explain how torque speed characteristic will be modified with (i) change in applied voltage (ii) change in applied frequency	**07**
Q.2	**(a)**	Explain operation of step down chopper with duty ratio control.	**03**
	(b)	Explain smooth starting of converter based operation of DC motor.	**04**
	(c)	Explain losses occurring in DC drive with one quadrant chopper. Discuss how losses will change if four quadrant chopper is used in drive as compared to operation with one quadrant chopper.	**07**
		OR	
	(c)	Derive the equation of armature current for discontinuous mode of operation of chopper based drive for separately excited DC motor.	**07**
Q.3	**(a)**	Explain current controller specification for chopper based speed control of separately excited DC motor.	**03**
	(b)	Explain operation of induction motor with flux weakening.	**04**
	(c)	Explain a 4 quadrant chopper circuit suitable for 4 quadrant operation of DC motor.	**07**
		OR	
Q.3	**(a)**	Explain speed controller specification for chopper based speed control of separately excited DC motor.	**03**
	(b)	Explain characteristic of fan and pump load driven by induction motor.	**04**
	(c)	What is regenerative breaking? Explain regenerative breaking of separately excited DC motor operated with 4 quadrant chopper.	**07**
Q.4	**(a)**	Draw equivalent circuit of induction motor with proper nomenclature.	**03**
	(b)	Explain sinusoidal pulse width modulation for inverter.	**04**
	(c)	Derive transfer function of DC motor using dynamic modeling.	**07**
		OR	

Q.4	**(a)**	List advantages of scaler control of induction motor.	**03**
	(b)	Explain generation of basic vectors for space vector modulation.	**04**
	(c)	Draw block diagram of chopper based DC drive with closed loop operation with speed control and current control. Explain working of each block.	**07**
Q.5	**(a)**	Draw and Explain how torque speed characteristic of induction motor will be changed with change in rotor resistance.	**03**
	(b)	Explain V/f control of induction motor.	**04**
	(c)	Schematize closed loop control of induction motor based on slip power recovery and explain the schematic.	**07**

OR

Q.5	**(a)**	Compare ac drive and dc drive on the basis of (i) converter used (ii) self start (iii) quantity to be varied for speed control	**03**
	(b)	Draw and Explain how torque speed characteristic of induction motor will be modified with change in voltage and frequency.	**04**
	(c)	Schematize closed loop V/F control of induction motor and explain the schematic	**07**

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