Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER– VII (New) EXAMINATION – WINTER 2019

Subject Code: 2171707 **Date: 23/11/2019**

Subject Name: Industrial Drives and Control

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.**

Q.1	**(a)**	Why PWM inverter used to control speed of Induction motor? Explain in brief.	**03**
	(b)	Explain various drive circuits for the stepper motors, in brief.	**04**
	(c)	Discuss the basic working theory of DC servo motor. Finds its governing equation and transfer function also. Derive state space modeling of DC motor drive with block diagram.	**07**
Q.2	**(a)**	Why is the duty cycle usually changed by varying the on time rather than the chopping frequency? Explain in brief.	**03**
	(b)	Discuss brushless DC motor and its speed control strategy.	**04**
	(c)	Draw the waveforms of 1st Quadrant chopper operation for DC motor drive & Explain with relevant calculation.	**07**
		OR	
	(c)	Draw the waveforms of 3rd Quadrant chopper operation for DC motor drive & Explain with relevant calculation.	**07**
Q.3	**(a)**	Explain torque versus stepping rate characteristics for Stepper motor.	**03**
	(b)	Discuss the Merits and Demerits of Volts/ Hz control strategy for AC drive .	**04**
	(c)	Explain Chopper principle used in electrical drive with circuit, waveform and equation.	**07**
		OR	
Q.3	**(a)**	List out important features of the stepper motors.	**03**
	(b)	Discuss the static frequency changers for AC motor drive, in brief.	**04**
	(c)	Compare the performance features of six step and PWM control of Voltage-source inverter in terms of Harmonics, control complexity and ease of implementation.	**07**
Q.4	**(a)**	State essential parts of Electrical drives.	**03**
	(b)	What are factors that limit the high frequency operation of DC chopper switching operation?	**04**
	(c)	Explain the operation of a Variable Reluctance stepper motor.	**07**
		OR	

Q.4	**(a)**	What are the main factors which decide the choice of electrical drive for a given application?	**03**
	(b)	Discuss the various measuring scheme for motor constants with diagram/calculation for DC motor, in brief.	**04**
	(c)	Design a Digital controller for a hysteresis current control for DC chopper drive.	**07**
Q.5	**(a)**	What are the functions of Power modulator?	**03**
	(b)	Explain multi-pulse modulation technique for the induction motor, in brief.	**04**
	(c)	What do you mean by DC servo motor closed loop speed control ? Explain it with diagram.	**07**

OR

Q.5	**(a)**	Explain operation of Permanent Magnet stepper motor, in brief.	**03**
	(b)	Discuss in brief, Phase Locked Loop (PLL) control of the DC motor drive with block diagram.	**04**
	(c)	Explain the operation of half-bridge modified McMurray inverter.	**07**