Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

M.E –Ist SEMESTER–EXAMINATION – JULY- 2012

Subject code: 714502N **Date: 07/07/2012**

Subject Name: Solid State DC Drives

Time: 2:30 pm – 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.**

Q.1	**(a)**	What is the effect of back-emf on the firing angle and avg. output voltage? Draw necessary waveforms.	**07**
	(b)	What is the difference between dynamic braking and regenerative braking? Write down the expressions for the average output voltage for step down and step up chopper.	**07**
Q.2	**(a)**	Explain operation of DC motor in forward motoring and forward braking with proper type of chopper. Explain both quadrant operations with appropriate wave forms.	**07**
	(b)	Draw equivalent circuit and output voltage waveform of an ideal dual converter. derive necessary condition of firing angles.	**07**
		OR	
	(b)	Develop transfer function of speed control of DC motor with PI controller and current control loop.	**07**
Q.3	**(a)**	Write a program flow chart for speed control of DC motor with current control.	**07**
	(b)	Why PLL is better for speed control of DC motor. Explain basic PLL operation.	**07**
Q.3	**(a)**	Develop a transfer function of separately excited DC motor with speed control loop. Give the limitation of only speed control loop.	**07**
	(b)	Develop a linearized transfer model of DC series motor.	**07**
Q.4	**(a)**	Explain the principle of phase control. Obtain the equation of output voltage of phase controlled dc motor drive.	**07**
	(b)	Explain the speed control of dc series motor using tap changing transformer and uncontrolled rectifier.	**07**
		OR	
Q.4	**(a)**	A 220 volt, 960 rpm, 12.8 A separately excited dc motor has armature resistance and inductance of 2 ohm and 150 mH, respectively. It is fed from a single phase half-controlled rectifier with an a.c. source of 230 volt, 50 Hz. Calculate (i) Motor torque for $\alpha = 60^{\circ}$ and speed = 600 RPM. (ii) motor Speed for $\alpha = 60^{\circ}$ and torque= 20 N-m.	**07**

	(b)	Explain torque and power limitations for combined armature voltage and field control method.	**07**
Q.5	**(a)**	What is meant by input power factor in controlled rectifier? Write the equations.	**07**
	(b)	Explain 3-phase full-wave controlled converter. Draw the waveforms of O/P voltage, O/P current and voltage across thyristor1 for $\alpha=30°$, $\alpha=90°$ and $\alpha=120°$ for continuous conduction.	**07**

OR

Q.5	**(a)**	Explain different types of control strategies for chopper drive.	**07**
	(b)	Explain the armature control and flux control of dc motors.	**07**

****