Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

M. E. - SEMESTER – I • EXAMINATION – SUMMER • 2013

Subject code: 714502N **Date: 04-06-2013**

Subject Name: Solid State DC Drives

Time: 10.30 am – 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)**	Draw the basic block diagram of electric drive system and explain each block.	**07**
	(b)	The field current of a separately excited motor is variable from zero to rated voltage. Derive the dynamic equation of the DC Motor.	**07**
Q.2	**(a)**	For type-A dc chopper with RLE load and continuous load current condition shows that per unit ripple current is maximum when duty cycle is 0.5. Also draw the necessary waveforms and circuit diagram.	**07**
	(b)	Explain the armature control and flux control of dc motors and also explain constant torque and constant power operation.	**07**
		OR	
	(b)	A separately excited DC Motor with the following parameters: Ra=0.4 ohm, La=0.003H and Kb=0.7 V/rad/Sec. is deriving a load of J=0.0166 kg-m^2, B1=0.01 N-m/rad/sec. with a load torque of 100 N.m. Its armature is connected to a DC supply voltage of 220 V and is given the rated field current. Find the speed of the motor.	**07**
Q.3	**(a)**	Explain four quadrant operation of DC motor. Also mention constant power and constant power region operation in the characteristic.	**07**
	(b)	Explain the voltage source three phase controlled converter.	**07**
		OR	
Q.3	**(a)**	Explain the Ward Leonard speed control method of DC motor.	
	(b)	Explain the principle of phase control. Obtain the equation of output voltage of phase controlled dc motor drive.	**07**
Q.4	**(a)**	Discuss the control design for a two quadrant chopper circuit.	**07**
	(b)	Draw circuit diagram, waveform and write the equations for 1-phase full controlled converter, separately excited dc motor drive where current of the armature is assumed to be continuous and FD is connected in anti parallel with the armature of DC motor.	**07**
		OR	
Q.4	**(a)**	Develop a linearized transfer model of separately exited DC motor.	**07**
	(b)	Give simulation block diagram of speed control of DC motor with current control loop and current limiting. Give the effect of current limiting with respect to response of the speed.	**07**
Q.5	**(a)**	Explain synchronizing firing of circuit, pulse transformer and draw circuit for gate protection.	**07**
Q.5	**(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**
		OR	
Q.5	**(a)**	Explain different types of control strategies for chopper drive.	**07**
	(b)	Explain the Close loop control of DC drive.	**07**

****