Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

M. E. - SEMESTER – II • EXAMINATION – WINTER 2012

Subject code: 1722902 **Date: 31-12-2012**

Subject Name: Modern Electric 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.**
4. **Notations used have usual meaning.**

Q.1	**(a)**	Discuss the characteristics of induction motor with a view to stable operation.	**07**
	(b)	Explain reference frame theory for electrical machine.	**07**
Q.2	**(a)**	Explain operation of DC motor operated with full controlled converter.	**07**
	(b)	A 200 V, 1500 rpm rated, 10 h. p. separately excited dc motor is supplied by a single phase controlled bridge rectifier and is connected to a load having a torque of 30 Nm at a speed of 1000 rpm. The other data for drive are R_a =0.20 ohms, back emf constant K_b=68 V/(Wb rad/s), Φ_f=12x10^{-3}Wb, and ac supply voltage V_s=150 V at 50 Hz. Assume that friction and no-load losses are negligible and that the load is highly inductive, Compute (1) the torque developed by a motor (2) the firing angle of thyristors.	**07**
		OR	
	(b)	A separately excited DC motor has a rating of 50 h. p. and when supplied by a battery of 480 V through chopper, it has a mean armature current of 120 A. the field is also supplied by a chopper whose source is a battery of 250 V. other data for chopper based drive are R_a=0.2 ohms, R_f=125 ohms, K_b=72 V/(Wb rad/s), Φ_f=0.015I_f, duty cycle for armature circuit is D_a=0.7 and for field circuit D_f=0.9. The armature circuit has sufficient inductance to make the current continuous. Compute (1) the speed of a motor (2) torque developed by a motor.	**07**
Q.3	**(a)**	Discuss closed loop operation of DC motor drive with chopper circuit.	**07**
	(b)	Describe class B chopper circuit for speed control of DC motor.	**07**
		OR	
Q.3	**(a)**	Explain working of first quadrant chopper circuit for DC motor.	**07**
	(b)	Discuss four quadrant chopper circuit for DC motor.	**07**
Q.4	**(a)**	Explain derating of induction motor operated with voltage source inverter circuit.	**07**
	(b)	Write a brief note on modeling of DC motor.	**07**
		OR	
Q.4	**(a)**	Discuss basic principle of direct torque control of induction motor control	**07**
	(b)	Compare operation of induction motor operated through current source inverter and voltage source inverter.	**07**
Q.5	**(a)**	Discuss the self-control operation of synchronous motor.	**07**
	(b)	Explain indirect vector control scheme for induction motor.	**07**
		OR	
Q.5	**(a)**	Explain space vector modulation control.	**07**
	(b)	Explain continuous, intermittent and short duty cycle of motor operation.	**07**

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