GUJARAT TECHNOLOGICAL UNIVERSITY
ME - SEMESTER–I(New course)• EXAMINATION – WINTER- 2015

Subject Code: 2710709   **Date: 04/01/2016**

Subject Name: Electrical Drives

Time: 2:30 pm to 5:00 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)**	Describe the various components of load torques.	**07**
	(b)	i. Explain factors affecting the ratings of converters and motors with help of speed-torque characteristics.	**07**
		ii. Explain speed transition from lower speed to higher speed in four quadrant drive. Comment on performance in context of ratings of drive.	

Q.2	**(a)**	Explain DC dynamic braking of induction motor and derive expression of maximum braking torque.	**07**
	(b)	A 220V, 1400 rpm, 12A separately excited motor is controlled by a 1-phase fully controlled rectifier with an ac source voltage of 230A, 50Hz. Armature resistance and inductance are $R_a = 1.8\Omega$ and $L_a = 30mH$, respectively. i. What should be the value of the firing angle to get the rated torque at 950 rpm? ii. What would be motor torque for $\alpha = 60°$ and speed = 375rpm.	**07**

OR

	(b)	A 220V, 1400 rpm, 12A separately excited motor is controlled by a 1-phase fully controlled rectifier with an ac source voltage of 230A, 50Hz. Armature resistance and inductance are $R_a = 1.8\Omega$ and $L_a = 30mH$, respectively. i. Calculate the firing angle for the rated braking torque and -1400rpm? ii. What would be motor torque for $\alpha = 60°$ and speed = 950rpm.	**07**

Q.3	**(a)**	Explain motoring Mode-I (conventional) and Mode-III (with controlled fly wheeling) operation of 1-phase fully controlled rectifier-fed DC separately excited motor.	**07**
	(b)	Explain the Sine-PWM modulation technique for 1-phase fully controlled rectifier.	**07**

OR

Q.3	**(a)**	Explain Mode-V (conventional) and Mode-VII (with controlled fly wheeling) operation of 1-phase fully controlled rectifier-fed separately excited motor for regenerative braking action.	**07**
	(b)	Draw and explain closed loop armature control scheme with field weakening of separately excited DC motor.	**07**

Q.4	**(a)**	Write a brief note on modified Kramer drive.	**07**
	(b)	Derive the expression of speed for time ratio control (TRC) using steady state analysis for chopper controlled DC separately excited motor. Explain its benefits and limitations.	**07**

OR

Q.4	**(a)**	Explain the principle of operation of a Static Scherbius drive. Also, discuss the possible modes of operation with the scheme.	**07**
	(b)	Compare current source and voltage source inverter induction motor drives.	**07**

Q.5	**(a)**	Explain the use of induction motors in fan and pump drives applications and	**07**

derive expression for ratio of maximum to rated motor current.

(b) Draw and explain Current-Source-Inverter variable frequency drive with slip speed control. **07**

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OR

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Q.5 **(a)** Discuss the method for injection of voltage in the rotor circuit to control the speed of an induction motor in a super-synchronous region. **07**

(b) What is Dual converter? Draw and explain how the circulating current is controlled in dual converter with simultaneous control. **07**

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