Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

ME - SEMESTER– II(Old course) • EXAMINATION (Remedial) – WINTER- 2015

Subject Code: 1724501 **Date: 09/12/2015**

Subject Name: SOLID STATE AC 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)**	Sketch a typical torqueï speed curve for an induction machine, covering the range of slips from 2 to -1. Identify the motoring, generating and braking regions. Which quadrants of the torqueï speed plane are accessible when an induction machine is operating from a constant voltage and constant frequency supply?	**07**
	(b)	Compare voltage control, rotor resistance and frequency control methods for speed control of induction motor. Give the suitable applications of each speed control method.	**07**
Q.2	**(a)**	Draw the block diagram of static voltage controlled three phase induction motor drive for closed loop operation. Explain the function of each block.	**07**
	(b)	With diagram describe operation of the static slip power recovery scheme for an induction motor.	**07**
		OR	
	(b)	Explain the variable frequency speed control method of VSI fed three phase induction motor. Explain the necessity to maintain constant V/F ratio.	**07**
Q.3	**(a)**	What is the effect of motor inductance on VSI and CSI fed induction motor drive. State the advantages of CSI fed induction motor drive over VSI fed drive.	**07**
	(b)	Explain field oriented control of induction motor. Write benefits of the method with justifications.	**07**
		OR	
Q.3	**(a)**	Draw the block diagram of closed loop CSI fed three phase induction motor drive. Explain the function of each block.	**07**
	(b)	Explain indirect vector control of induction motor with current model.	**07**
Q.4	**(a)**	How direct torque control method differs from field oriented control of Induction Motor? Specify advantages and applications of DTC.	**07**
	(b)	A three-phase, 11.2 kW, 1750 rpm, 460 V, 60 Hz, four pole, Y-connected induction motor has the following parameters : Rs = 0.1 Ohm, Rrô= 0.38 Ohm, Xs=1.14 Ohm, Xrô=1.71 Ohm, and Xm =33.2 Ohm. If the breakdown torque requirement is 35 Nm, Calculate : a) the frequency of supply voltage, b) speed of motor at the maximum torque	**07**
		OR	
Q.4	**(a)**	Derive torque equations of Induction motor with stator and rotor flux for DTC.	**07**
	(b)	Briefly explain brush and brushless excitation for wound field synchronous machine drives.	**07**

Q.5	**(a)**	Explain self-controlled synchronous motor drive employing load commutated thyristor inverter.	**07**
	(b)	List out different methods for speed estimation of Induction Motor. Draw the block diagram of sensorless vector control method for Induction Motor.	**07**

OR

Q.5	**(a)**	Explain power factor control of synchronous motor with changing excitation for constant load torque.	**07**
	(b)	What is self-controlled and true synchronous mode of variable frequency controlled synchronous motor?	**07**

****