Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

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

Subject code: 734501 Date: 30/12/2012

Subject Name: Application of Power Electronics to Power System

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)**	List the FACTS devices. Give a classification of series, shunt and Hybrid FACTS devices. Mention the advantages of FACTS devices over conventional compensating methods.	**07**
	(b)	Explain significance of reactive power control. Also Compare Series and Shunt Capacitor compensators.	**07**
Q.2	**(a)**	With suitable diagram describe the Thyristor Controlled Reactor (TCR) also discuss its applications in the power system	**07**
	(b)	Explain the operating characteristic of TCR with voltage control and how under voltage problem can be resolved using FC - TCR. **OR**	**07**
	(b)	Explain V – I characteristic of TSC – TCR with and without voltage control	**07**
Q.3	**(a)**	Compare P-δ curve as a parametric function of Series compensation provided by SSSC and Series capacitor	**07**
	(b)	Briefly describe the working of a Thyristor Controlled Transformer (TCT)	**07**
		OR	
Q.3	**(a)**	Discuss Capability of SSSC to provide Real Power Compensation	**07**
	(b)	Explain the construction and working of a UPFC	**07**
Q.4	**(a)**	Explain the "direct" output voltage control scheme based on internal voltage (magnitude and angle) control at a sustained dc capacitor voltage for implementation of STATCOM. Draw relevant schematic block diagram and waveforms.	**07**
	(b)	Show that for the operating load angle δ =35°, the var rating of series compensator is around 10% of that required of a shunt compensator for the same change in power transfer.	**07**
		OR	
Q.4	**(a)**	Explain the application of STATCOM for damping of power oscillations in a power system. Discuss the control strategy used.	**07**
	(b)	Using relevant phasor diagram and equations, explain how a shunt connected switching converter type var generator can be used as a bidirectional active-reactive power compensator based on the principle of operation of STATCOM.	**07**
Q.5	**(a)**	Explain the principle of operation of basic Thyristor-Controlled Series Capacitor (TCSC) scheme.	**07**
	(b)	State and explain any one application of TCSC in power system.	**07**
		OR	
Q.5	**(a)**	Draw and explain reactance (X_{TCSC}) vs thyristor firing delay angle (α) characteristics of TCSC.	**07**
	(b)	Draw and explain compensating voltage vs line current characteristics of TCSC in voltage control mode and reactance control mode.	**07**

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