Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

M.E. SEMESTER III–EXAMINATION (Remedial)– WINTER 2015

Subject code: 734501 Date: 04/12/2015

Subject Name: Application of Power Electronics to Power System

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)** Justify: Voltage Source Converter is building block of Flexible AC Transmission System. Draw necessary diagram in support. **07**

(b) With the help of Phasor diagrams and mathematical equations explain conventional transmission capabilities of the Unified Power Flow Controller. **07**

Q.2 **(a)** For a 400 kV, 50 Hz, 600 km long symmetrical line is operated at the rated voltage, determine: **07**

(i) Theoretical maximum Power carried by the line. Also midpoint voltage corresponding to this condition.

(ii) The reactance of a series capacitor, connected at the midpoint of the line double the power transmitted.

Consider, l = 1 mH/km and c = 11.1 X 10^{-9} F/km

(b) List various operating modes of Thyristor Controlled Series Capacitor for controlled series compensation. Also analyze the same for Vernier control operation. **07**

OR

(b) Explain the operation of Thyristor Controlled Series Capacitor with the help of Impedance Vs delay angle α Characteristics. **07**

Q.3 **(a)** Explain two-machine (two-bus) transmission model of power system with an ideal midpoint Reactive Compensator. Draw necessary circuit and diagram in support. **07**

(b) Explain Thyristor Controlled Reactor with necessary circuit. In context with the same also draw (i) firing angle delay control and (ii) operating waveforms. **07**

OR

Q.3 **(a)** Describe applications of Flexible AC Transmission System controller in distribution system. Also list and briefly describe the Power Quality problems related to same. **07**

(b) Explain Thyristor Switched Capacitor and condition for Transient Free Operation with necessary circuit and all associated waveforms. **07**

Q.4 **(a)** State importance of a Static Var Compensator configuration. Explain the same with necessary circuit and waveforms. **07**

(b) Draw a basic block diagram for Static Var Compensator controller incorporating voltage regulator. Also explain function/ working of each block. **07**

OR

Q.4 **(a)** Explain Fixed Capacitor-Thyristor Controlled reactor type Var Generator. Draw only neat and labeled functional control scheme for the same. **07**

	(b)	List and discuss issues related to Voltage Regulator Design with respect to Static Var Compensator.	**07**
Q.5	**(a)**	List and justify advantages of Static Synchronous Compensator over Static Var Compensator and Synchronous Condenser. Draw necessary diagram in support.	**07**
	(b)	Draw a neat and labeled circuit for Gate Turn Off Thyristor based three phase Six Pulse Static Synchronous Compensator. Write mathematical expression in support.	**07**

OR

Q.5	**(a)**	Draw (i) ideal V-I Characteristics and (ii) function block diagram related to dynamic behavior of the Static Compensator. List important outcome from the same.	**07**
	(b)	Explain significance of a Twelve Pulse Static Synchronous Compensator. Draw necessary relevant circuit and waveforms in support.	**07**

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