Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

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

Subject Code: 1720705 **Date: 11/12/2015**

Subject Name: Application of Power Electronics in Power Systems

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)**	Define and explain following in brief. a) TCSC, b) TSC, c) UPFC, d) SVS	**07**
	(b)	Compare STATCOM, Synchronous Condenser and SVC.	**07**
Q.2	**(a)**	Explain basic principle and different modes of operation of TCSC.	**07**
	(b)	Derive an expression for mid-point voltage of a symmetrical lossless transmission line as a function of power flow on it.	**07**
		OR	
	(b)	Discuss TCSC impedance at subsynchronous frequencies.	**07**
Q.3	**(a)**	Discuss the Thyristor Switched Reactor and the Segmented TCR	**07**
	(b)	Draw and explain an enhanced TCSC current-control structure.	**07**
		OR	
Q.3	**(a)**	Derive expression of net reactance of the TCSC in per units of the nominal reactance of the fixed capacitor (X_C). Also draw the variation of per-unit TCSC reactance as a function of firing angle.	**07**
	(b)	Explain operating characteristics of TCR.	**07**
Q.4	**(a)**	For a short transmission line, derive the ratio of change in power transfer to the VAR rating of the series passive (capacitive) compensator.	**07**
	(b)	Draw the waveforms of current through TCR, voltage across thyristors and voltage across inductor for firing angle Ŭ= 90° and Ŭ= 150° .	**07**
		OR	
Q.4	**(a)**	For a given 735 kV, 60 Hz, 800 km long, symmetrical transmission line with l = 0.932 mH/km, c = 12.2 nF/km mid-point compensated line, the var compensator operating range is -400 to +200 MVAR. Obtain the range for operating load angle ŭ. V_{mc} is to be held at 1.03 pu.	**07**
	(b)	Draw and explain the block diagram of a typical TCSC power control structure.	**07**
Q.5	**(a)**	Explain the basic working principle of IPFC.	**07**
	(b)	What is SSR? Explain the IEEE First Benchmark System with a STATCOM for SSR damping.	**07**
		OR	
Q.5	**(a)**	Explain with the help of suitable diagram working principle of STATCOM and its VI characteristic.	**07**
	(b)	Explain the basic working principle of UPFC.	**07**

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