Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

M. E. Sem. – II[nd] - Examination – June/July- 2011

Subject code: 1720705

Subject Name: Application of Power Electronics in Power Systems

Date:27/06/2011 **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)** Explain different practical switching strategies with the help of capacitor current, capacitor voltage and supply voltage waveforms for TSC. **07**

(b) Explain single phase TCR with the help of appropriate diagrams. Derive expression of the fundamental component of current and also discuss harmonics contents present in TCR current. **07**

Q.2 **(a)** Compare STATCOM and various other var compensating devices. **07**

(b) Explain operating characteristic of FC-TCR with step down transformer. **07**

OR

(b) "The var net rating of the series compensator is only 5% of that required of a shunt compensator for the same change in power transfer for operating load angle δ of 25°." Justify this with the help of derivation. **07**

Q.3 **(a)** For a given 735 kV, 50 Hz, 700 km long, symmetrical transmission line with l =0.91 mH/km, c = 12.1 nF/km mid- point compensated line, find uncompensated real power (Ps), compensated real power (Pcomp) with unlimited capacity compensator at midpoint with maintained mid point voltage to be 1.03 pu and injected reactive power (Qv*)*.The value of load angle δ is 27 deg. Also comment on results. **07**

(b) Define and explain following in brief. **07**

a) TCSC, b) TSC, c) UPFC, d) SVS

OR

Q.3 **(a)** For a given 735 kV, 50 Hz, 750 km long, symmetrical transmission line with l =0.935 mH/km, c = 12.3 nF/km mid- point compensated line, the var compensator operating range is -300 to +600 MVAR. Obtain the range for operating load angle δ. V_{mc} is to be held at 1.05 pu. **07**

	(b)	List different analytical methods used for SSR analysis. State advantages and disadvantages of one of them. Also draw and explain the IEEE First Benchmark System with STATCOM for SSR damping.	**07**
Q.4	**(a)**	Write the operating principle of UPFC and also list its applications.	**07**
	(b)	Explain three phase six pulse STATCOM. Also draw and explain the waveforms of capacitor voltage and current.	**07**

OR

Q.4	**(a)**	Explain Selective Harmonic-Elimination Modulation (SHEM) technique used in BVSI.	**07**
	(b)	Explain losses occurred in single module and multimodule TCSC in detail.	**07**
Q.5	**(a)**	Explain voltage collapse prevention with help of TCSC.	**07**
	(b)	Explain basic concepts of Thyristor Controlled Braking Resistor (TCBR).	**07**

OR

Q.5	**(a)**	Explain the V-I and X-I capability characteristics of the single module TCSC for continuous time application, short duration implementation and 1-10s.	**07**
	(b)	Draw and explain the block diagram of a typical TCSC power control structure.	**07**

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