Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

ME – SEMESTER II (OLD) – • EXAMINATION – SUMMER 2016

Subject Code: 1720705 Date:19/05/2016

Subject Name: Application of Power Electronics in Power Systems

Time:10:30 am to 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)**	Series compensation of long transmission line is less popular due to certain practical and economic limitations imposed by series capacitors. Justify the statement.	**07**
	(b)	Explain current characteristic of TSC-TCR.	**07**
Q.2	**(a)**	For a given symmetrical long transmission line, a designer wants to maintain mid-point voltage near to end point voltages. Derive the expression for the mid-point voltage of symmetrical line as a function of power flow.	**07**
	(b)	Explain Selective Harmonic-Elimination Modulation (SHEM) technique used in BVSI.	**07**
		OR	
	(b)	Discuss *X-I* capability characteristics for multi-module TCSC.	**07**
Q.3	**(a)**	Draw schematic of STATCOM and explain significance of each block of its control system.	**07**
	(b)	For a given 1000 kV, 50 Hz, 1000 km long, symmetrical lossless transmission line with l = 0.85 mH/km, c = 13.1 nF/km mid- point compensated line, find uncompensated real power (P_s), compensated real power (P_{comp}) with unlimited capacity compensator at midpoint with maintained mid point voltage 1.02 p.u. and injected reactive power (Q_v).The value of load angle δ is 30°. Also comment on results.	**07**
		OR	
Q.3	**(a)**	For a given 765 kV, 50 Hz, 1000 km long, symmetrical transmission line with l =0.84 mH/km, c = 14 nF/km mid- point compensated line the realistic midpoint VAR compensator is incorporated and rated to operate from -750 to 0 MVAR. Find the working operating range for mid-point voltage and operating load angle δ. V_{mc} is to be held at 1.015 p.u. Also, comment on result.	**07**
	(b)	Discuss NGH-SSR damping scheme. Also, draw main components of the NGH damper prototype and its arrangement.	**07**
Q.4	**(a)**	Draw and explain *V-I* capability characteristics for single-module TCSC.	**07**
	(b)	Explain the *V-I* characteristics of a TCR with voltage control with the help of its control system.	**07**
		OR	
Q.4	**(a)**	What is SSR? Explain the IEEE First Benchmark System with a STATCOM for SSR damping.	**07**
	(b)	Explain single phase TCR. Derive the expression of the fundamental component of current and also discuss harmonics contents present in TCR current.	**07**
Q.5	**(a)**	Explain multilevel VSC-based STATCOM and its associated problems.	**07**
	(b)	Define and explain following in brief. a)TCR b)TSC c)TSSR d)FACTs	**07**
		OR	
Q.5	**(a)**	Explain basic working principle of IPFC. Also, explain its advantages and drawbacks.	**07**
	(b)	Explain single phase TCR. Draw the waveforms for current through TCR, voltage across thyristor and voltage across inductor for firing angle α = 105°and α = 150°.	**07**

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