Seat No.: _____   Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY
ME - SEMESTER– II (Old course)• REMEDIAL EXAMINATION – SUMMER 2015

Subject Code: 1720705   **Date:14/05/2015**

Subject Name: **Application of Power Electronics to Power System**

Time: 02:30 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)** Explain Automatic Generation Control (AGC) and Excitation Control mechanism.   **07**

(b) Derive an expression for mid-point voltage of a symmetrical lossless transmission line as a function of power flow on it. Also, mention the typical values of line inductance and capacitance.   **07**

Q.2 **(a)** Explain (a) Load Compensation and (b) System Compensation and its effect on system.   **07**

(b) Explain Multilevel VSC-Based STATCOM and state its salient features.   **07**

OR

(b) Explain the working principle of UPFC and its various power flow control functions with the help of phasor diagrams.   **07**

Q.3 **(a)** For a given 765 *kV*, 50 *Hz*, 1000 *km* long, symmetrical transmission line with l =0.93 *mH/km*, c = 12.1 *nF/km* mid- point compensated line, compute uncompensated real power (P_s), compensated real power (P_{comp}) with unlimited capacity compensator at midpoint maintaining mid-point voltage to be 1.02 *pu* and injected reactive power (Q_v).The value of load angle δ is 30°. Also comment on results.   **07**

(b) Explain FC-TCR and its *V-I* characteristics without coupling transformer.   **07**

OR

Q.3 **(a)** Explain with the help of suitable diagram working principle of STATCOM and it V-I characteristic.   **07**

(b) For a given 765 *kV*, 50 *Hz*, 1000 *km* long, symmetrical transmission line with l = 0.93 *mH/km*, c = 12.1 *nF/km* mid- point compensated line, the operating load angle   can be varied from 20° to 60°. Find the MVAR capacity range for var compensator. V_{mc} is to be held at 1.03 *pu*. Also, comment on results.   **07**

Q.4 **(a)** Define and explain following in brief.
i) TCR   ii) TSC   iii) TSSR   iv) FACTs   **07**

(b) Draw simplified reactance capability curve of a multi-module TCSC and explain it. Also, draw *V-I* capability characteristic for a multi-module (2 and 3 modules) TCSC.   **07**

OR

Q.4 **(a)** Explain TCSC constant-angle (CA) controller model in detail. Also, explain the role of   regulator with the help of suitable diagram.   **07**

(b) Explain synchronous condenser and its application in power system.   **07**

Q.5 **(a)** Explain Harmonic performance of TCSC.   **07**

(b) Draw and explain voltage-current characteristic and current characteristics of TSC-TCR.   **07**

OR

Q.5 **(a)** Explain how the collapsing of voltage in system can be prevented using TCSC. **07**
Also, draw typical voltage profile for critical bus employing TCSC.

(b) Draw and explain *IEEE* First Benchmark System and its components. List **07**
various methods used for analysis of SSR and explain any one in detail.

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