

Seat No.: _____

Enrolment No. _____

GUJARAT TECHNOLOGICAL UNIVERSITY

M. E. - SEMESTER – II • EXAMINATION – SUMMER • 2014

Subject code: 1720707

Date: 23-06-2014

Subject Name: Flexible AC Transmission System

Time: 02:30 pm - 05:00 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 with necessary waveforms the construction and principle of working of a TCR (Thyristor Controlled Reactor). Also plot its V-I characteristics. How is a TSR (Thyristor switched reactor) different from a TCR. **07**
- (b) With a neat diagram, brief the principle of operation of a STATCOM along with its V-I characteristics. **07**

- Q.2** (a) Explain the principle of operation of an SSSC. Discuss its basic control scheme and hence show its different operating modes. **07**
- (b) Discuss the operation of a TCSC in its bypassed thyristor mode, blocked thyristor mode and vernier mode. **07**

OR

- (b) Draw the basic circuit of a TSSC and show how the degree of series compensation is controlled by it in a step wise manner. What are the drawbacks of using a TSSC? **07**
- Q.3** (a) Discuss how a Static Phase Shifting Transformer (SPST) is used to control the flow of power in a transmission line. Make suitable derivations to support your answer. **07**
- (b) How is the transient stability margin of a system increased using mid point series compensation. **07**

OR

- Q.3** (a) Draw the functional control scheme of a TSC-TCR and thus explain how it operates. **07**
- (b) Discuss the parallel operation of two SVCs for load sharing considering the below mentioned cases. 1). Without current droop. 2). With current droop. **07**
- Q.4** (a) A UPFC is the most versatile FACTS controller. Justify this statement. **07**
- (b) Discuss the 6 pulse voltage source converter type STATCOM with a neat diagram. **07**

OR

- Q.4** (a) Explain in detail how the IPFC addresses the problem of compensating a number of transmission lines in a given substation. **07**
- (b) Derive the expression for the active and reactive power when mid point shunt compensation is provided on the transmission line. Also draw the corresponding waveforms with and without compensation. **07**
- Q.5** (a) What are the various benefits of using FACTS technology as compared to conventional methods. **07**
- (b) Explain in brief the TCSC analysis and hence plot the variation of TCSC reactance with firing angle $\div \alpha$ **07**

OR

- Q.5** (a) Enlist various applications of TCSC. **07**
- (b) How is the third harmonic distortion possible using SVC voltage control. **07**
