

GUJARAT TECHNOLOGICAL UNIVERSITY**M. E. - SEMESTER – II • EXAMINATION – SUMMER • 2013****Subject code: 1720707****Date: 05-06-2013****Subject Name: Flexible AC Transmission Systems****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)** Discuss active and reactive power control by VSC based controller and also explain control modes of STATCOM with the help of appropriate diagram and equations. **07**
- (b)** Explain principle of operation of UPFC connected to EHV line and also mention advantages and applications offered by it. **07**
- Q.2 (a)** What is the significance of different modes of TCSC operation? Also discuss capacitive-vernier control mode and inductive-vernier control mode for TCSC. **07**
- (b)** Explain phenomena of SSR and discuss the mitigation of it using TCSC with the help of appropriate diagram and equations. **07**
- OR**
- (b)** Discuss in detail the issue of generation of harmonics in concern to the compensation of transmission line by various FACTS controllers. **07**
- Q.3 (a)** Discuss the operating characteristics of TSC-TCR when mismatched of ratings of TSCs and TCRs. **07**
- (b)** Discuss the importance of having slope in the dynamic characteristic of SVC. **07**
- OR**
- Q.3 (a)** Discuss the parallel operation of two SVCs. **07**
- (b)** Describe the analysis of current transients when an ideal ac voltage source is connected to a capacitor through a bidirectional thyristor switch. **07**
- Q.4 (a)** Describe in brief the influence of SVC on the system voltage to which it is connected if coupling transformer is considered **07**
- (b)** A 400 kV, 50 Hz, 600 km long symmetrical line is operated at the rated voltage. Find (1) Theoretical maximum power carried by the line? (2) Reactance value of the series capacitor connected at the midpoint of the line to double the power flow (3) Now a midpoint compensation is done by a shunt connected capacitor of 450 Ohms and If the midpoint voltage is 0.97, Compute the power flow in line when. Assume data as: l (inductance) = 1 mH/km, c (capacitance) = 11.1×10^{-9} F/km. **07**
- OR**
- Q.4 (a)** Explain the active power and reactive power supplied by the compensator when connected at midpoint with the help of appropriate diagram and equations. **07**
- Q.4 (b)** Discuss the performance characteristic of synchronous condenser and also explain how dynamic reactive power support is provided at HVDC terminals connected to weak ac systems. **07**

Q.5 (a) Justify the importance of reactive power control in transmission line and enumerate the limitations of various conventional reactive power control methods. **07**

(b) Explain how the inherent voltage control capacity and current overloading capability of Saturated Reactor type of compensator enables it to control large voltage excursions of EHV transmission line with the help of single line diagram and operating characteristic of it. **07**

OR

Q.5 (a) Explain how the loading capacity of a transmission line is limited by various factors? **07**

(b) Mention the possible benefits of FACTS technology and discuss the comparison of FACTS and HVDC technology for power transmission. **07**
