Roll No.:								

B.E. / B.Tech. (Full Time) DEGREE EXAMINATIONS, May 2013

ELECTRICAL & ELECTRONICS ENGINEERING BRANCH

EIGHTH SEMESTER

EE9038- FLEXIBLE AC TRANSMISSION SYSTEMS

(REGULATIONS 2008)

Time: 3 hr **Max. Marks: 100**

Answer ALL Questions

PART-A (10 X 2 = 20 Marks)

1. Compare the performance of STATCOM and SVC.
2. Draw V-I and X-I characteristics of single module TCSC.
3. Write the advantages of slope in SVC dynamic characteristics.
4. What is need for variable series compensation
5. Compare load and system compensation.
6. Show that with the delta connected 3-phase TCR the triplen harmonics will be absent in the line currents.
7. Graphically show how the voltage distribution will be along the transmission line for (i) surge impedance loading(ii) less than surge impedance loading and (iii) greater than surge impedance loading.
8. What are the advantages of FACTS controllers?
9. What is the need for co-ordination of FACTS controllers?
10. Compare the performance of SSSC with that of a fixed series capacitor.

PART-B (5x16 = 80 marks)

11.(i) Consider a 765kV symmetrical lossless transmission line with l=0.965mH/km, c=12.6nF/km, and a line length of 1000km. calculate the voltage at a distance of 550km from the sending end when the power flow through the line is 860MW.(4)

(ii) Derive from the fundamentals the expressions for the voltage and current at any distance x from the sending end of loss-less distributed parameter line. (12)

12.(a) Show that with SVC transient stability margin can be improved by enhancing synchronizing torque. Derive the necessary equations. (16)

[OR]

12.(b) (i) Explain the design procedure of SVC-voltage regulator by the method of system gain(10)

(ii) An SVC is connected to 765 kV system has a reactive power range of 550 MVAR production to 250 MVAR absorption. If the per unit proportional gain of voltage regular is to be 0.65 determine the short-circuit level of the system. The SVC has a slope of 3%.(6)

13.(a) (i). Explain about the various operating modes of TCSC. (6)

(ii). Derive the expression for steady-state thyristor current when the TCSC is operating in the vernier mode with the necessary waveforms.(10)

[OR]

13.(b) (i) Explain about the modelling of TCSC for power flow analysis. (6)

(ii) Consider a SMIB system in which the synchronous machine is generating 0.8 p.u.MW and 0.25 p.u. MVAR. The infinite bus voltage is $1\angle 0^{\circ}$. The machine transient reactance is 0.32 p.u. and the transmission line reactance is 0.650 p.u. Calculate the value of net reactance offered by the TCSC and the voltage that has to be injected by the TCSC to enhance the power transfer to 1.0 p.u. (10)

14(a) (i) Explain the operation of STATCOM.(8)

(ii) Consider a transmission line a STATCOM is connected at midpoint of the line. Assume that both end voltages are regulated at 1 p.u, the transmission line reactance is 0.8 p.u. calculate the current that must be injected by STATCOM to maintain the midpoint voltage at 1.01 p.u. When the load at receiving end is varied from 0 to 0.9 p.u.(8)

[OR]

14(b) (i) Discuss about the operation of SSSC and compare the performance of SSSC with that of fixed capacitor compensation.(8)

(ii) Consider a SMIB system in which the synchronous machine is generating 0.95 p.u. MW and 0.35 p.u. MVAR at a terminal voltage of $1\angle 36^{\circ}$. The machine transient reactance is 0.25 p.u. and the transmission line reactance is 0.600 p.u. If the damping ratio has to be 0.12 calculate how the voltage injected by the SSSC has to be modulated. (8)

15(a) Explain the operation of UPFC with relevant diagrams.(16)

[OR]

15(b) (i) Explain the steps that are to be followed for the co-ordinated tuning of FACTS controllers to maximize the system damping. (8)

(ii) Explain about the effect of electrical coupling and short-circuit level on the controller interaction between multiple SVCs that are located in a power system. (8)