26/11/13.

Roll No. | | | | | | | | | | |

B.E / B.Tech (Full Time) DEGREE END SEMESTER EXAMINATIONS, NOV / DEC 2013

ELECTRICAL AND ELECTRONICS ENGINEERING

24

VII - Semester

EE9038 – FLEXIBLE AC TRANSMISSION SYSTEMS

(Regulation 2008)

Time: 3 Hours | Answer ALL Questions | Max. Marks 100

PART-A (10 x 2 = 20 Marks)

1. What are the objectives of line compensation?
2. What is load compensation?
3. Write the advantages of slope in SVC dynamic characteristics.
4. Show that with the delta connected 3-phase TCR the triplen harmonics will be absent in the line currents.
5. Draw the IEEE basic block diagram model 1 of the SVC control system.
6. Draw V-I and X- I characteristics of single module TCSC.
7. What are the important limits that are considered in the capability characteristics of TCSC?
8. What are applications of STATCOM?
9. What are the operational constraints encountered in UPFC?
10. What is the need for co-ordination of FACTS controllers?

Part – B (5 x 16 = 80 marks)

11. i) Prove that the var rating of series compensator required is only 7.2% of that of a shunt compensator for same change in power transfer of a transmission line with load angle of 30°. (6)

ii). Consider a 735 kV symmetrical lossless line with l = 0.965 mH/km, C=11.6 nF/km, and a line length of 600 km. Calculate the characteristic impedance, SIL, and the no-load compensation that is required at the receiving end so that the voltage is maintained at 1 pu. Also calculate the midpoint voltage. System nominal frequency is 50 Hz. (10)

12. a) i). Explain the operation of TCR and derive the expression for susceptance in terms of firing angle. (10)

ii). How transients are eliminated in the TSC operation and explain the practical switching strategies of TSC. (6)

(OR)

b) i). Show that with SVC the transient stability margin can be improved by enhancing synchronizing torque. Derive the necessary equations. (8)

ii). An SVC is connected to 765 kV system has a reactive power range of 550 MVAR production to 300 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 4%. (8)

13. a) i). Describe the modeling of the SVC for power-system studies. (6)

ii). Explain the design procedure of SVC voltage regulator by the method of system gain. (10)

(OR)

b) i). Draw circuit diagram of TCSC and explain its principle of operation. (8)

ii). Explain the constant current controller model of TCSC. (8)

14. a) i). Derive the expression for steady state thyristor current and reactance when the TCSC is operating in the vernier mode? (10)

ii). Discuss the application of TCSC for enhancement of power system damping. (6)

(OR)

b) With neat circuit diagrams explain the working principles of STATCOM and SSSC. (16)

15. a) i). Explain the operation of UPFC with relevant diagrams. (12)

ii). Compare the capabilities of different types of FACTS controllers. (4)

(OR)

b) i). 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)

ii). Explain the basic procedure for FACTS Controller design. (8)