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Question Paper Code : 52934

B.E./B.Tech. DEGREE EXAMINATIONS, APRIL/MAY 2019.

Seventh Semester

Electrical and Electronics Engineering

EE 6004 – FLEXIBLE AC TRANSMISSION SYSTEMS

(Regulation 2013)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Define the term FACTS.

2. What are the objectives of shunt compensation?

3. What are the advantages of the slope in the SVC dynamic characteristic?

4. How many midpoint SVC's are required to enhance the maximum power transfer capability of the transmission line to thrice that of the uncompensated line?

5. Draw the V-I capability curve for single module TCSC.

6. What is the need for variable series compensation?

7. List the applications of STATCOM.

8. Define voltage stability.

9. What do you understand by coordination of FACTS controllers?

10. What is genetic algorithm (GA)?

PART B — (5 × 13 = 65 marks)

11. (a) Consider a 765 kV symmetrical lossless transmission line with inductance L = 0.965 mH/km and capacitance C = 11.65 nF/km. The line length is 800 km. Calculate MVAR required to maintain the midpoint voltage at 1.04 pu when power flow through the line is in the range of 750 to 850 MW.

Or

(b) Consider a 765 kV symmetrical lossless transmission line with inductance, l = 0.98 mH/km and capacitance, $c = 14\,nF/km$. The line length is 900 km. Calculate the midpoint voltage at 56 % of surge impedance loading.

12. (a) Explain the operation of the SVC with TSC and TCR combination and derive the equations used. Also explain how the SVC is able to regulate the voltage.

Or

(b) Show that with the help of power angle curve, the voltage-control operation of the midline SVC can enhance transient stability margin.

13. (a) Explain the basic principle and different operating modes of TCSC.

Or

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

14. (a) With neat diagram explain the operation of STATCOM with V-I characteristics.

Or

(b) Explain the working principle as well as control principle of SSSC in detail.

15. (a) Discuss the effect of electrical coupling and short circuit level on the controller interaction between multiple SVCs that are located in a power system.

Or

(b) Explain the co-ordination of multiple FACTS controllers using genetic algorithm.

PART C — (1 × 15 = 15 marks)

16. (a) Consider a transmission line in which STATCOM is connected at the midpoint. Assume that both end voltages are regulated at 1pu. The line reactance is 0.8pu. Calculate the current that must be injected by STATCOM to maintain midpoint voltage at 1.01pu when load at the receiving end is varied from 0 to 0.9pu.

Or

(b) The synchronous machine shown in Fig.16(b) is delivering 0.8 puMW and 0.25 puMVAR at the infinite bus. The voltage of the infinite bus is 1+j0 pu. The generator is connected to the infinite bus through a line of reactance 0.65 pu. The machine transient reactance is 0.32 pu. A TCSC is connected in the transmission line to enhance the steady state power transfer. Calculate value of net reactance offered by TCSC and voltage that has to be injected by TCSC to enhance power transfer by1 pu.

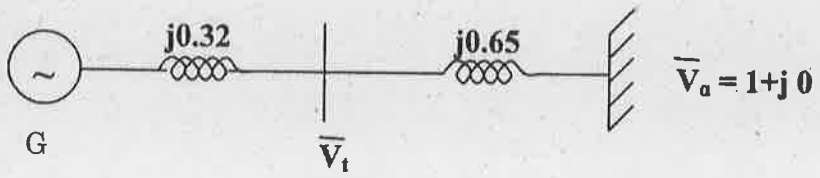

Figure 16 (b)