Reg. No. : | | | | | | | | | | | | |

Question Paper Code : 40979

B.E./B.Tech. DEGREE EXAMINATION, APRIL/MAY 2018
Seventh Semester
Electrical and Electronics Engineering
EE 6004 – FLEXIBLE AC TRANSMISSION SYSTEMS
(Regulations 2013)

Time : Three Hours | Maximum : 100 Marks

Answer ALL questions

PART – A (10×2=20 Marks)

1. What is the necessity of compensation ?
2. Which compensator is used for both active and reactive power control ?
3. Mention the role of SVC in preventing voltage instability.
4. Write the factors to be considered for designing SVC to regulate mid-point voltage.
5. What are the advantages of TCSC ?
6. Draw the variable reactance model of TCSC.
7. Write the significance of sub-synchronous resonance.
8. Name the strategies used for controlling the output voltage of STATCOM.
9. What is the need for coordination of FACTs controllers ?
10. What is the main problem with multiple SVCs in a power system network ?

PART – B (5×16=80 Marks)

11. a) Explain how a 3-phase delta connected TCR is used to compensate the reactive power of a transmission line with neat diagrams and waveforms. (16)

(OR)

b) i) Discuss how the power transfer capability of a transmission line can be improved by using series compensation. (8)

ii) Discuss briefly the power flow model of UPFC. (8)

12. a) Describe the working principle of the two types of Static Var Compensators (SVC) with neat schematic diagrams. **(16)**

(OR)

b) A 400 kV, 50 Hz, 600 km long symmetrical line is operated at the rated voltage.

i) What is the theoretical maximum power carried by the line ? What is the midpoint voltage corresponding to this condition ? **(5)**

ii) A series capacitor is connected at the midpoint of the line to double the power transmitted. What is its reactance ? **(5)**

iii) A shunt capacitor of value 450 ohms is connected at the midpoint of the line. If the midpoint voltage is 0.97, compute the power flow in the line corresponding to this operating point. Data : L = 1 mH/km, c = 11.1×10^{-9} F/km. **(6)**

13. a) Draw and explain the block diagram of the variable reactance model of TCSC and hence derive transient stability and long term stability models. **(16)**

(OR)

b) The particulars of a transmission line are V = 220 V, f = 60 Hz, X = 12 Ω and Pp = 56 KW. The particulars of the TCSC are δ = 80°, C = 20 μF and L = 0.4 mH. Find i) the degree of compensation r, ii) the compensating capacitance reactance X_{comp}, iii) the line current I, iv) the reactive power Qc, v) the delay angle of the TCSC if the effective capacitive reactance is $X_T = -50\ \Omega$, and vi) plot $X_L(\alpha)$ and $X_T(\alpha)$ against the delay angle α. **(3+3+3+3+2+2)**

14. a) Explain the principle of operation and V-I characteristics of STATCOM. **(16)**

(OR)

b) Discuss in detail about the modeling of SSSC in load flow and transient stability studies. **(16)**

15. a) Describe in detail the coordinated tuning of FACTS controllers using Genetic algorithm for damping power system oscillations. **(16)**

(OR)

b) Describe the coordination procedure of multiple controllers using linear-control techniques. **(16)**