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**Question Paper Code : 21495**

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2015.

Eighth Semester

Electrical and Electronics Engineering

EE 2036/EE 809/10133 EEE 45 — FLEXIBLE AC TRANSMISSION SYSTEMS

(Regulations 2008/2010)

(Common to PTEE 2036 – Flexible AC Transmission Systems for B.E. (Part-Time)  
Seventh Semester – EEE – Regulations 2009)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. What is the need for reactive power control in electrical power transmission lines?
2. Differentiate between UPFC and IPFC.
3. What are the advantages of slope in SVC dynamic characteristics?
4. How can the voltage profile be improved by making use of SVC?
5. What are the different modes of operation of TCSC?
6. What is Bang-Bang control?
7. What are the areas in which a STATCOM can improve power-system performance?
8. State the difficulties with implementation of UPFC in power flow.
9. List the possible combinations of FACTS controller interactions.
10. State the advantages of Genetic Algorithm.

PART B — (5 × 16 = 80 marks)

11. (a) (i) What are the merits and demerits of FACTS? (8)  
(ii) Draw and explain a typical TSSC scheme. Write the benefits offered by TSSC compared to mechanically switched series capacitors. (4 + 4)

Or

- (b) (i) Derive from the fundamentals the expressions for the voltage and current at any distance 'x' from the sending end of a lossless distributed parameter line. (8)  
(ii) Describe briefly about Shunt compensation and Series compensation of transmission lines. (4 + 4)
12. (a) (i) Explain how the system gain relates the deviation in SVC bus voltage to SVC susceptance. (6)  
(ii) Describe the principle of SVC auxiliary control for improving the electrical damping of power systems. (10)

Or

- (b) Show that an SVC can significantly improve the transient stability margin of a power system by enhancing the synchronizing torque. Derive the necessary equations. (16)
13. (a) Explain the working,  $X - I$  capability characteristics and operating modes of variable reactance model of TCSC. (16)

Or

- (b) (i) State the advantages of TCSC. (6)  
(ii) Explain the following applications of TCSC. (6 + 4)  
(1) Improvement of the system-stability limit  
(2) Voltage collapse prevention.
14. (a) With neat power circuit and equivalent circuit, describe the working principle of a STATCOM. Explain how the reactive- and real-power exchange between the STATCOM and the ac system can be controlled independently of each other. (16)

Or

- (b) Explain the principle of operation and applications of UPFC. (16)

15. (a) (i) Explain the need for coordinated tuning of FACTS controllers. (6)
- (ii) Describe the effect of electrical coupling and short-circuit levels on the controller interaction between multiple SVCs that are located in a power system. (10)

Or

- (b) (i) Give the frequency ranges of different FACTS controller interactions. (4)
- (ii) Explain the steps involved in the multiple FACTS controller design procedure. (12)
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