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Eighth semester B. Tech Degree Examination
(2013 Scheme)
Subject : 13.806.2 HVDC and FACTS (E) Elective V

Instructions: 1) Part A : All questions are compulsory.

2) Part B : Answer one questions from each module. Each question carries 20 marks.

Time : 3 hours

Max.marks : 100

Part A

1. What are the different methods to improve transient stability?
2. What are the benefits from FACTS technology?
3. Mention different types of FACTS controllers?
4. What are the objectives of SVC in transmission lines?
5. Draw the configuration of a TSC.
6. How shunt compensation solve the problem of Ferranti effect?
7. In which of the aspects, series compensator improves the performance of a line?
8. Draw the impedance vs delay angle characteristics of a TCSC.
9. Draw the equivalent circuit of a DC link,
10. Explain the basic concepts of DC circuit interruption.

2x10 = 20

Part B
Module I

- 11.a) Derive the expression for active and reactive power flow in a transmission line in terms of sending end voltage, receiving end voltage, line reactance and load angle.
b) How the power angle characteristics help in assessing the transient stability?
- 12.a) Derive the expressions for the midpoint voltage, current and power flow in an un compensated transmission line.
b) A 600km lossless three phase, 50Hz, 400kV symmetrical line is operated at rated voltage. The line has series inductance of 1.0 mH/km and shunt capacitance of 11.1×10^{-9} F/km. What is the theoretical maximum power carried by the line? What is the midpoint voltage for this condition?

Module II

- 13.a) Explain the operation and control of a TCR with neat sketches.
b) Draw the voltage and current waveforms of a TSC. What are the problems associated with the switching of a TSC?
- 14.a) Explain the basic principle of STATCOM with the help of Phasor diagram. How it supplies the reactive power for different voltage conditions?
b) Compare the performance of SVC and STATCOM on the basis of their V-I characteristics.

Module III

- 15.a) Explain the operation of a GCSC with waveforms.
- b) How the operation of a TSSC differs from that of GCSC?
- 16.a) Draw the circuit diagram of a TCSC. Explain how the effective reactance varies with different operating modes.
- b) How a UPFC control all the parameters affecting the power flow in line? Explain with diagrams.

Module IV

- 17.a) Draw the schematic diagram of a typical HVDC converter station and explain the major components.
- b) Derive the expression for the average dc voltage at the output of a Graetz circuit without overlap.
- 18.a) Explain different types of DC link. What are the problems associated with monopolar operation?
- b) Compare AC and DC transmission systems. What are the applications of DC transmission?

