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B.E / B.Tech (Full Time) DEGREE END SEMESTER EXAMINATIONS, April / May 2014

ELECTRICAL AND ELECTRONICS ENGINEERING

VII - Semester

EE9037 – EHV POWER TRANSMISSION

(Regulation 2008)

Time: 3 Hours Answer ALL Questions Max. Marks 100

PART-A (10 x 2 = 20 Marks)

1. What are the standard transmission voltages used in India?
2. A power of 3500 MW is to be transmitted over a span of 800 km using 750 kV EHV AC line. Determine the optimal number of circuits required with 40% line compensation.
3. State the advantages of bundled conductors.
4. Why stranded conductors with steel core are used for EHV AC power transmission?
5. Name the existing HVDC systems in India with their power rating.
6. What is 'break even distance'?
7. What is the need for FACTS controllers?
8. Compare the fixed series and fixed shunt compensation.
9. What is meant by primary shock currents?
10. What are the different electrode configurations used in measurement of electrostatic field?

Part – B (5 x 16 = 80 marks)

11. i) Prove that the percentage power loss in transmission line is independent of line length. (8)

ii). A power of 12,000 MW is required to be transmitted over a distance of 1000 km. At voltage levels of 750 kV and 1000 kV, determine the currents transmitted and the total line losses. The magnitudes for sending and receiving end voltages are equal with 30°phase difference. The line resistance and reactance values are given below.

	750 kV	1000 kV
r (ohm.km)	0.0136	0.0036
x (ohm/km)	0.272	0.231

(8)

12. a) Derive an expression for total inductance of a solid round conductor due to internal and external flux linkages. (16)

(OR)

b) The dimensions of a 3-phase 400-kV horizontal line are as follows: Height of conductor from ground H = 15 m, phase separation S = 11 m, conductor diameter = 2 × 3.18 cm, and bundle spacing B = 45.72 cm. Calculate the matrix of capacitances per km, when the conductors are completely transposed. (16)

13. a) i). With neat circuit diagram explain the power control in a HVDC link. (10)
ii). Explain the different types of HVDC link with neat circuit diagrams. (6)

(OR)

b) i). Draw a typical HVDC layout and explain their basic components. (8)
ii). Explain the principal of operation of HVDC circuit breaker. (8)

14. a) i). Explain the operation of unified power flow controller with relevant diagrams. (12)
ii). Compare the capabilities of different types of FACTS controllers. (4)

(OR)

b) Consider a 735 kV symmetrical lossless line with l = 0.965 mH/km, C=11.6 nF/km, and a line length of 800 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. (16)

15. a) Evaluate the horizontal, vertical and total value of electrostatic field components near the single circuit transmission line, which are energized by three phase voltages. (16)

(OR)

b) i). Discuss the effect of high electrostatic field on humans, animals and plants. (8)
ii). Describe about the various types of shock currents. (8)