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**B.Tech. -IN - ELECTRICAL
ENGINEERING (BTELVI)****Term-End Examination****December, 2013****BIEE-003 : POWER SYSTEM - I***Time : 3 hours**Maximum Marks : 70*

Note : Attempt any seven questions. All questions carry equal marks.

1. Show that for overhead systems the ratios of volumes of conductors in dc, single phase a.c.(mid-pt. earthed) and 3 - phase ac are given by $V_1: V_2: V_3 = 1 : \frac{2}{\cos^2 \phi} : \frac{2}{\cos^2 \phi}$ where $\cos \phi$ is the p.f. of the load. Assume equal power transmitted over equal length with equal losses and maximum voltage to earth to be same in all cases. 10
2. What is method of images ? Derive an expression for the capacitance per unit length of a 3- phase line completely transposed. What is the effect of earth on the capacitance of the line ? 10

3. Determine the inductance of a 1 - phase transmission line having the arrangement of conductors shown in Fig 1. One circuit consists of three wires of 2mm dia. each and other circuit two wires of 4mm dia. each. 10

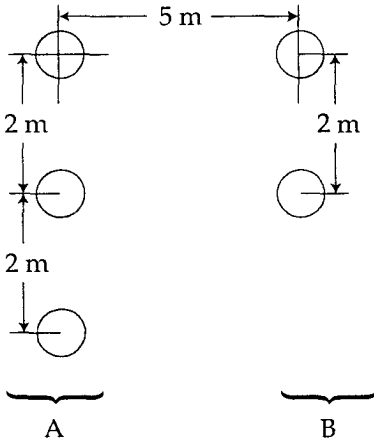


Fig. 1

4. Determine the A,B,C,D parameters of a 3-phase, 400 km, 50 Hz transmission line with series impedance of $(0.15+j 0.78)$ ohm/km and a shunt admittance of $j 5.0 \times 10^{-6}$ ohm/km. When the line is represented by nominal -T representation. 10
5. Derive from the first principles
- (a) The expressions for disruptive critical voltage between two smooth circular wires and potential gradient any point along a line joining their centres. 5
- (b) What are the factors affecting corona loss ? 5
What are the methods of reducing this loss ?

6. (a) Why the transmission line is designed based on worst probable conditions and not worst possible conditions ? 4
- (b) An overhead line at a river crossing is supported from two towers of heights 30 metres and 90 metres above water level with a span of 300 metres. The weight of the conductor is 1kg./metre and the working tension is 2000 kg. Determine the clearance between conductor and the water level mid-way between the towers. 6
7. (a) Discuss different types of insulators used for overhead transmission lines. 4
- (b) Explain the various methods for improving the string efficiency in a string of insulators. 6
8. (a) What is meant by grading of a cable ? Discuss the methods of grading and their disadvantages. 5
- (b) Compare the transmission of electrical energy by overhead lines and underground cables. 5
9. (a) What is meant by 'natural loading' of lines ? Explain with reasons the economic loading of overhead and underground cables. 5
- (b) Discuss the action of synchronous phase modifier for voltage regulation of a line and increasing the carrying capacity of a transmission line. 5
10. Write short notes on *any two* of the following : 10
- (a) Ferranti Effect.
- (b) Vibration Dampers.
- (c) Kelvin's law.
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