No. of Printed Pages : 4

BIEE-003

00312

B.Tech. - IN - ELECTRICAL ENGINEERING (BTELVI)

Term-End Examination

December, 2011

BIEE-003 : POWER SYSTEM - I

Time : 3 hours *Maximum Marks : 70*

Note : Attempt any *seven* questions of the following and all questions ***carry equal*** marks.

1. Derive the expression for the capacitance of 3-phase unsymmetrically spaced transmission line for single conductor. **10**

2. Explain transmission of power by different system and also discuss comparison of different system of transmission. **10**

3. (a) Explain corona loss in transmission line. **4**

(b) Estimate the corona loss for a three phase, 110kV, 50Hz, 150km long transmission line consisting of three conductors each of 10mm diameter and spaced 2.5m apart in an equilateral triangle formation. The temperature of air is 30°C and the atmospheric pressure is 750mm of mercury take the irregularity factor as 0.85. Ionization of air may be assumed to take place at maximum voltage gradient of 30kV/cm. **6**

4. Show that when the voltage drop due to resistance and reactance is small compared with the line voltage, the voltage drop along three phase transmission line per Ampere km is given by the expression 10

$\sqrt{3}$ (R cosϕ + X sinϕ), where R is resistance per km of conductor, X is the reactance per km of conductor. s cos ϕ the power factor factor of the load.

5. (a) Draw the equivalent circuits for short, medium and long transmission line. 4

(b) The following particular refer to a 2-camel ACSR conductor used on a 400kV line : 6

Size of conductor 64/3.35mm Al, 7/3.35mm steel.

Ultimate tensile strength = 14740 kgf.

Area of cross-section conductor = 538.4 mm^2.

Modulus of elasticity = 7000kg/mm^2.

Weight of conductor = 1.805 kg/m.

Wind pressure = 100 kgf/m.

Span = 335m

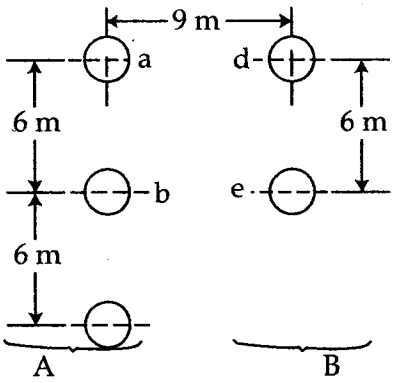
Coefficient of linear expansion = 19.3×10^{-6}/°C.

The wind load on the conductor may be assumed to be acting one two-third of the exposed area. Ice loading is neglected. Determine tension and slag.

(i) at 0°C and full wind, factory safety = 2.

6. A 66 kV concentric cable with two inter-sheaths has a core diameter 1.8 cm. Dielectric material 3.5mm thick constitutes the three zones of insulation. Determine the maximum stress in each of the three layers if 20kV is maintained across each of the inner two. **10**

7. Determine the inductance of a 1 - ϕ transmission line consisting of three conductors of 2.5mm radii in the 'go' conductors and two conductors of 5mm radii in the' return, conductor. The configuration of the line is as shown fig. **10**



8. What is metal sheathing ? Explain different type of power cables. **10**

9. Explain different type of insulators used for overhead lines and also give brief detail of each. **10**

10. Write short notes on any *two* of the following. 10

(a) Application of GMD, GMR methods.

(b) Ferranti effect.

(c) Kelvin's law and its limitations.