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

Term-End Examination

June, 2013

BIEE-003 : POWER SYSTEM - I

Time : 3 hours   *Maximum Marks : 70*

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

1. Show that for the transmission of power over a given length, power loss is inversely proportional to the square of transmission voltage and also inversely proportional to the square of power factor in case of a.c. systems   **10**

2. Derive the expressions for inductance of a 3 - phase line with conductors untransposed. What is the significance of imaginary term in the expression of inductance ? Hence derive the expression for inductance for a completely transposed line.   **10**

3. Determine the capacitance and charging current   **10**
   per unit length of the line when the arrangement
   of the conductor is shown in Fig. 1. The line is
   completely transposed. The diameter of
   conductor is 15 mm, and the operating voltage is
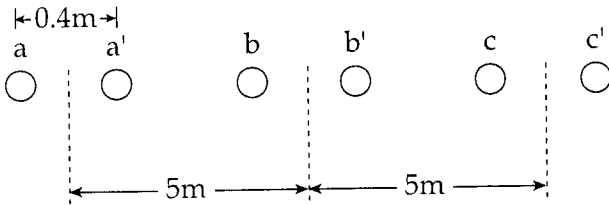   220 kV.

Fig. 1

4. (a) Explain the classification of lines based on   **4**
       their length of transmission.

   (b) Explain how would you obtain A, B, C, D   **6**
       parameters of a model of a long transmission
       line in the laboratory ?

5. A 3-phase, 50 Hz transmission line has a   **10**
   resistance, inductance and capacitance per phase
   of 10 ohm, 0.1 H and 0.9 μF respectively and
   delivers a load of 35 MW at 132 kV and 0.8 pf
   lag. Determine the efficiency and regulation of
   the line using nominal - T method.

6. Derive the expressions for sag and tension in a   **10**
   power conductor strung between two supports
   at equal heights taking into account the wind and
   ice loadings also.

7. (a) What is corona ? What are its advantages   4
        and disadvantages ?

    (b) A string of eight suspension insulators is to   6
        be graded to obtain uniform distribution of
        voltage across the string. If the capacitance
        of the top unit is ten times the capacitance
        to ground of each unit, determine the
        capacitance of the remaining seven unit.

8. (a) Describe with a neat sketch, the construction   6
        of a 3 - core belted type cable. Discuss the
        limitations of such a cable.

    (b) What are the losses taking place in cables ?   4

9. (a) State and prove Kelvin's law for   5
        determining economic size of conductors for
        overhead transmission lines.

    (b) Explain 'Ferranti effect' with a phasor   5
        diagram.

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

    (a) Skin and Proximity effect.

    (b) Surge Impedance Loading

    (c) Types of Insulators.