Total number of printed pages – 7

B. Tech

CPEE 5303

Fifth Semester Examination – 2008

TRANSMISSION AND DISTRIBUTION

Full Marks – 70

Time : 3 Hours

*Answer Question No. **1** which is compulsory and any **five** from the rest.*

The figures in the right-hand margin indicate marks.

1. Answer the following questions : 2×10

   (i) Define regulation of a transmission line.

   (ii) Explain clearly the advantages of feeding a distributor at two points over feeding at one point.

   (iii) State the limitations of solid cables.

P.T.O.

(iv) What is surge impedance loading ?

(v) What is skin effect ?

(vi) State the advantages of neutral grounding of an electrical system.

(vii) What is the function of a booster ?

(viii) What is the reaction of a voltage wave when it see an impedance other than the surge impedance at the receiving end.

(ix) What happens when the capacitive reactance of a transmission line is very high ?

(x) What are primary transmission and secondary transmission ?

2. (a) How is sag calculated when the supports are at the same level ? 4

(b) A transmission line conductor consists of hard drawn copper 240 mm^2 in X-section and has a span of 160 meters, the supporting structures being level. The

conductor has an ultimate strength of 42.2 kg/mm^2 and the desired factor of safety is 5. Find the vertical sag with a wind pressure of 1.35 kg/meter length and an ice coating of 1.25 cm. Take the density of hard drawn copper as 8.9 g/cc and weight of ice as 915 kg/m^3. 6

3. (a) Describe any method of improving the string efficiency. 4

(b) The self capacitance of each unit in a string of three suspension insulators is C. The shunting capacitance of the connecting metal work of each insulator to earth is 0.15C while for line it is 0.1 C. Calculate:

(i) The voltage across each insulator as a percentage of the line voltage to earth, and

(ii) the string efficiency. 6

4. (a) What is corona loss"? How it can be reduced ? 4

(b) Find the disruptive critical and visual corona voltages of a grid line operating at 132 kV. The data are given :

Conductor diameter = 1.9 cm ;

conductor spacing = 3.81 m ;

temperature = 44° C:

barometric pressure = 73.7 cm ;

Conductor surface factor : Fine weather = 0.8,

rough weather = 0.66. 6

5. Fig. 1 shows the arrangement of a double circuit single-phase line. Conductor a, a' form one connection and conductors b, b' form return connection. The distance between a and a' is 80 cm and between a and b is

160 cm. If the diameter of each conductor is 2.2 cm, determine the total inductance per km of the line. 10

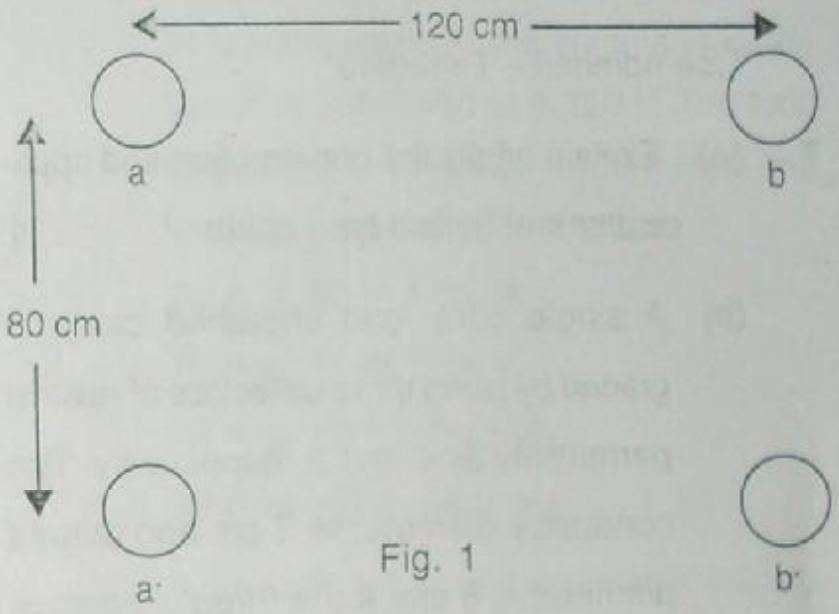

Fig. 1

6. A 3-phasc, 50Hz, 100 km long transmission line has Ihe following line constants : Resistance/phase/km = 0.1 Ω ; Reactance/phase/km = 0.5Ω ; Susccptance/phase/km =10×10^{-6} mho. If the line supplies load of 20 MW at 0.9 pf lagging at 66 kV at the receiving end, determine the following : 10

(i) sending end power factor,

(ii) percentage regulation, and

(iii) transmission efficiency.

Use nominal – T method

7. (a) Explain briefly the construction and applications of belted type cable. 4

(b) A single core lead sheathed cable is graded by using three dielectrics of relative permittivity 5, 4 and 3 respectively. The conductor diameter is 2 cm and overall diameter is 8 cm. If the three dielectrics are worked at the same maximum stress of 40 kV/cm, find the safe working voltage of the cable. What will be the value of safe working voltage for ungraded cable, assuming the same conductor and overall diameter and maximum dielectric stress ? 6

8. (a) Explain the design procedure of feeder and distributor in a distribution system. 4

(b) A DC distributor AB is fed at both ends. At feeding point A, the voltage is maintained at 235V and at B 236 V. The total length of the distributor is 200 meters and loads are tapped off as follows :

20 A at 50 m from A ;

40 A at 75 m from A ;

25 A at 100 m from A ;

30 A at 150 m from A.

If the resistance per km of one conductor is 0.4Ω . Calculate the minimum voltage and the point at which it occurs. 6