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10EE53

Fifth Semester B.E. Degree Examination, Dec.2017/Jan.2018
Transmission and Distribution

Time: 3 hrs. Max. Marks:100

Note: ***Answer FIVE full questions, selecting atleast TWO questions from each part.***

PART – A

1 a. Draw a line diagram of a typical power scheme indicating the standard voltages used at different voltage levels. Explain : i) Feeders ii) distributors iii) service mains. **(12 Marks)**

b. For the same power transmitted over the some distance, show that increase in transmission voltage of a transmission line results in :
i) increased efficiency ii) decreased line loss iii) reduced weight of conductor martial. **(08 Marks)**

2 a. Derive an expression for sag when the supports are at equal level for catenary configuration. **(10 Marks)**

b. A transmission line at a river crossing is supported from two towers at height of 40m and 30m above water level. The horizontal distance between two towers is 300m. If the tension in the conductor is 1500kg, find : i) minimum clearance ii) the clearance of the conductor at a point midway between the supports. Weight of conductor is 0.8 kg/m. **(06 Marks)**

c. Discuss the required properties for a conductor material for overhead line conductor. **(04 Marks)**

3 a. With a neat diagram explain Hewlett type suspension insulators. **(05 Marks)**

b. Define string efficiency. Explain the use of guard ring for improving string efficiency. **(06 Marks)**

c. A string of suspension insulator consists of 6 units. If the maximum voltage per unit is 33KV, calculate : i) the maximum voltage for which this string can be used ii) the string efficiency.
Assume capacitance between each link pin and earth as 15% of the self capacitance of each unit. **(09 Marks)**

4 a. Explain the phenomenon of corona on transmission line. Derive the expression for disruptive critical voltage. **(08 Marks)**

b. With a neat diagram, explain the general construction of an underground cable. **(06 Marks)**

c. Derive an expression for insulation resistance of a single core cable. **(06 Marks)**

PART – B

5 a. Derive an expression for inductance of a single phase two wire line. **(08 Marks)**

b. Discuss transposition of transmission line. **(04 Marks)**

c. A two wire single phase line operators at 50Hz. The diameter of each conductor is 20mm and the spacing between the conductor is 3m. Calculate : i) the loop inductance of the line per km ii) the inductance of the line per km iii) the inductive reactance per km. **(08 Marks)**

6 a. Derive an expression for capacitance of a 3 phase line with equilateral spacing. **(12 Marks)**

b. A 3-phase, 3 wire system has its conductors arranged at the corners of an equilateral triangle of 2m side. The diameter of each conductor is 2.5cm. Calculate the inductance and capacitance of each conductor. **(08 Marks)**

7 a. Obtain expression for ABCD constants for a nominal PIE model of a medium transmission line. **(10 Marks)**

b. A 3-phase, 50 50Hz, transmission line, 100km long delivers 20MW at 0.9pf lag and at 110KV. The resistance and reactance of the line per phase per km are 0.2 ohm and 0.4 ohm respectively, while the capacitive admittance is 2.5×10^{-6}mho/km. Calculate :
i) the voltage and current at the sending end ii) the efficiency of the transmission line. Use nominal T method. **(10 Marks)**

8 a. A 2 wire DC distributor AB is fed from both ends. At feeding point A, the voltage is maintained at 230V and at B 235V. The total length of feeder is 200m and loads are tapped off as under :
25A at 50m from A; 50A at 75m from A; 30A at 100m from A; 40A at 150m from A. The resistance per km of one conductor is 0.3ohm. i) the current in various sections of the distributors ii) minimum voltage and the point at which it occurs. **(10 Marks)**

b. A single phase distributor 2km long supplies a load of 120A at 0.8 pf lag at its far end and a load of 80A at 0.9pf lag at its mid point. Both power factors are referred to the voltage at the far end. The resistance and reactance/km (go and return) are 0.05 ohm and 0.1 ohm respectively. if the voltage at the far end is maintained at 230V, calculate : i) voltage at the sending end ii) phase angle between voltages at the two ends. **(10 Marks)**

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