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06EE53

Fifth Semester B.E. Degree Examination, December 2010
Transmission and Distribution

Time: 3 hrs. Max. Marks:100

Note: ***Answer any FIVE full questions, selecting at least TWO questions from each part.***

PART – A

1 a. Draw the line diagram of a typical power supply scheme, indicating the standard voltages. **(05 Marks)**

b. Discuss the effect of high voltage in transmission system. **(10 Marks)**

c. Write short notes on : i) Feeders ; ii) Distributors and iii) Service mains. **(05 Marks)**

2 a. Derive an expression for the stress in the conductor, during fair weather condition, in terms of worst probable condition, using the usual notation for the various quantities. **(06 Marks)**

b. Derive an expression for the sag in overhead conductors, when the supports are at different levels. **(04 Marks)**

c. Two towers of height 30 M and 90M respectively support a transmission line conductor at a water crossing. The horizontal distance between the towers is 500 m. If the tension in the conductor is 1600 kg, find the minimum clearance of the conductor and the water and the clearance mid – way between the supports. Weight of conductor is 1.5 kg/m. Bases of towers can be considered to be at water level. **(10 Marks)**

3 a. Explain the practical importance of corona. **(04 Marks)**

b. Explain the following terms with reference to corona : i) Disruptive critical voltage ; ii) Visual critical voltage ; iii) Power loss due to corona under fair weather conditions. **(06 Marks)**

c. Define string efficiency. How the string efficiency of an insulator is improved by using different methods? **(10 Marks)**

4 a. Each line of a 3 – phase system is suspended by a string of 3 similar insulators. If the voltage across the line unit is 17.5 kV, Calculate the line to neutral voltage. Assume that the shunt capacitance between each insulator and earth is $1/8^{th}$ of the capacitance of the insulator itself. Also find the string efficiency. **(06 Marks)**

b. Explain capacitance grading of cables and practical difficulties in grading. **(08 Marks)**

c. A single core cable has a conductor diameter of 2.5 cm and a sheath of inside diameter 6cm. Calculate the maximum stress. It is desired to reduce the maximum stress by using two intersheaths. Determine their best position, the maximum stress and the voltage an each; system voltage is 3 phase 66 kV. **(06 Marks)**

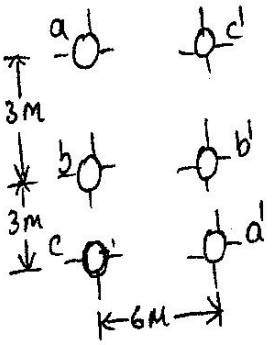
PART – B

5 a. Explain the terms self GMD and mutual GMD. **(04 Marks)**

b. Show that the inductance of a double circuit 3 phase line can be calculated by the method of GMD and GMR. Assume complete transposition. **(08 Marks)**

c. Fig.Q.5(c) shows the spacings of a double circuit 3 phase overhead line. The phase sequence is ABC and the line is completely transposed. The conductor radius is 1.3 cm. Find the inductance/phase/km. **(08 Marks)**

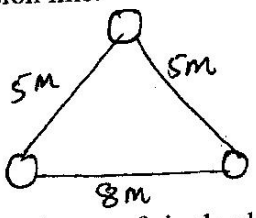
Fig.Q.5(c).



6 a. Derive an expression for the capacitance/phase of a 3 phase line with i) Equilateral spacing ; ii) unsymmetrical spacing (single circuit) transposed. **(10 Marks)**

b. A single circuit three plane – 50 Hz transmission line consists of three conductors, arranged as shown in the Fig.Q.6(b) below. If the conductors have diameter equal to 0.8 cm, find the inductive reactance of 25 km long line /km/ phase. Also calculate the capacitance and capacitive reactance of the transmission line. **(06 Marks)**

Fig.Q.6(b).



c. What is the effect of earth on the capacitance of single phase transmission line? **(04 Marks)**

7 a. Determine the efficiency and regulation of a 3 phase 100 km, 50 Hz transmission line delivering 20 Mw at a pf of 0.8 lag and 66 kV to a balanced load. The conductors are of copper, each having resistance of 0.10 Ω per km, 1.5 m outside diameter spaced equilaterally 2 metres between centres. Neglect leakage. Use nominal π method. **(10 Marks)**

b. Two transmission lines having generalized circuit constants A_1 B_1 C_1 D_1 and A_2 B_2 C_2 D_2 are connected in series. Develop expressions for the overall constants ABCD of the combination in terms of A_1 B_1 C_1 D_1 and A_2 B_2 C_2 D_2. **(06 Marks)**

c. Two - 3 phase transmission lines having generalized constants, as given below, are connected in series.

first line $A_1 = D_1 = 0.98 \angle 2^\circ$; $B_1 = 28 \angle 69^\circ\ \Omega$; $C_1 = 0.0002 \angle 88^\circ\ \mho$

second line $A_2 = D_2 = 0.95 \angle 3^\circ$; $B_2 = 40 \angle 85^\circ\ \Omega$; $C_2 = 0.0004 \angle 90^\circ\ \mho$, find the overall constants ABCD for a single 3 phase line, equivalent to the two lines in series, in the form $E_s = AE_r + BI_r$ and $I_s = CE_r + DI_r$. **(04 Marks)**

8 a. Differentiate radial and ring main systems. **(05 Marks)**

b. Explain how a 2 wire dc distributor, with concentrated load fed at one end, can be represented by a single line diagrams. **(08 Marks)**

c. An electric train taking a constant current of 600 amps moves on a section of line between two substations 8 km apart and maintained at 575 and 590 volts respectively. The track resistance is 0.04 Ω per km both go and return. Find the point of minimum potential along the track and currents supplied by two substantions at that instant. **(07 Marks)**

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