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10EE53

Fifth Semester B.E. Degree Examination, Dec.2013/Jan.2014
Transmission & Distribution

Time: 3 hrs. Max. Marks: 100

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

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

PART – A

1 a. Compare dc and ac systems with respect to :
(i) Bulk power generation.
(ii) Transmission voltage levels.
(iii) Line charging current and
(iv) Power conversion. **(08 Marks)**

b. Show that increase in transmission voltage causes:
(i) Reduction in copper losses.
(ii) Reduced weight of conductor material. **(06 Marks)**

c. Discuss the necessity of sag and tension calculations in erection of over head lines. **(06 Marks)**

2 a. Obtain an expression for sag of a line conductor suspended between two equal supports. Assume parabolic configuration. **(10 Marks)**

b. A transmission line has a span of 275 m with diameter 19.5 mm and weight 0.844 kg/m has a ultimate breaking strength of 7950 kg. Each conductor has a radial covering of ice 9.53 mm thick and is subjected to a horizontal wind pressure of 40 kg/m^2 of the ice covered projected area. If the factor of safety (FOS) is 2, calculate the deflected sag and vertical component of the sag. Given one cubic meter of ice weighs 913.5 kg. **(10 Marks)**

3 a. Explain the different methods to equalize the potential across a string of suspension insulator. **(10 Marks)**

b. An insulator for 66 KV is provided with 5 discs. The capacitance between the each joint and tower is $\frac{1}{6}^{th}$ of the self capacitance of each disc. Find the voltage across each disc and also the string efficiency. **(10 Marks)**

4 a. Explain the phenomenon of corona in over head transmission lines. **(06 Marks)**

b. Show that in a single core cable the ratio of maximum to minimum stress $\frac{g_{max}}{g_{min}} = \frac{R}{\gamma}$, where R = Sheath radius, γ = Core radius. **(08 Marks)**

c. A 33 KV, 3 phase underground cable, 4 km long, uses three single core cables. Each of the conductor has a diameter of 2.5 cm and the radial thickness of insulation 0.5 cm. The relative permittivity of the dielectric is 3. Find
(i) Capacitance of the cable / phase.
(ii) Charging current / phase.
(iii) Total charging KVAR. **(06 Marks)**

PART – B

5 a. Derive expressions for,
(i) Inductance due to internal flux linkage.
(ii) Inductance due to external flux linkage.
(iii) Inductance of a 1 - ϕ two wire line. **(14 Marks)**

b. Determine the loop inductance and reactance per km of a single – phase 50 Hz transmission line consisting of two parallel conductors spaced 1 m apart and 1.25 cm diameter. **(06 Marks)**

6 a. Obtain an expression for capacitance of a 3-ϕ, symmetrically spaced transmission line. **(10 Marks)**

b. Explain Ferranti effect in long transmission lines, with the help of a phasor diagram. **(06 Marks)**

c. Write a note on transposition of lines. **(04 Marks)**

7 a. Obtain expressions for sending end voltage and current in terms of ABCD constants and receiving end voltage and current for a nominal - π model of a transmission line. Also draw the phasor diagram. **(10 Marks)**

b. A 3 - ϕ, 50 Hz, overhead transmission line has the following distributed constants:
$R = 28\ \Omega,\ X_L = 63\Omega,\ T = 4\times10^{-4}$ ℧. **(10 Marks)**

8 a. What are the requirements of a good distribution system? **(04 Marks)**

b. A 1 - ϕ, distribution 2 km long supplies a load of 120 A at 0.8 pf lag at its far end and a load of 80 A at 0.9 pf lag at its midpoint. Both the power factors are referred to the voltage at far end. The resistance and reactance per km (go and return) are 0.05 Ω and 0.1 Ω respectively. If the voltage at the far end is maintained at 230 V, calculate (i) Voltage at the sending end. (ii) Phase angle between voltages at the two ends. **(12 Marks)**

c. Write a note on Feeders, distributions and service mains. **(04 Marks)**

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