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10EE53

Fifth Semester B.E. Degree Examination, July/August 2021
Transmission and Distribution

Time: 3 hrs. Max. Marks:100

Note: Answer any FIVE full questions.

1 a. With a line diagram, describe typical transmission and distribution scheme. **(06 Marks)**

b. Prove that the volume of conductor required in a transmission system is inversely proportional to the square of voltage as well as power factor of the load. **(07 Marks)**

c. Draw a schematic diagram and hence briefly describe feeders, distributors and service mains. **(07 Marks)**

2 a. Why ACSR conductors are preferred for transmission and distribution lines? **(04 Marks)**

b. Derive an expression for sag in a transmission lines between two supports at different levels. **(08 Marks)**

c. A transmission line has a span of 214 meters between level supports. The conductors have a cross section area of 3.225 cm^2. Calculate the factor of safety under the following conditions:
vertical sag = 2.35 mt
wind pressure = 1.5 kg/mt run
breaking stress = 2540 kg/cm^2
weight of conductor = 1.125 kg/mt run. **(08 Marks)**

3 a. State the various properties of an insulator. **(04 Marks)**

b. Define string efficiency. Explain the methods of improving string efficiency in detail. **(10 Marks)**

c. An insulator string consists of three units, each having a safe working voltage of 15 KV. The ratio of safe-capacitance to shunt capacitance of each unit is 8:1. Find the maximum safe working voltage of the string. **(06 Marks)**

4 a. Derive an expression for disruptive critical voltage. **(06 Marks)**

b. Derive an expression for capacitance of a single core cable. **(06 Marks)**

c. The inner conductor of a concentric cable has a diameter of 3.0 cm, the diameter over the insulation being 8.5 cm. The cable is insulated with two materials having relative permitivities of 5 and 3 respectively with corresponding safe working stresses of 38 KV/cm and 26 KV/cm. Calculate the radial thickness of each insulating layer and the safe working voltage of the cable. **(08 Marks)**

5 a. With a neat sketch, explain transposition of power lines. Why it is required to power lines? **(06 Marks)**

b. Derive an expression for the inductance of a 3 phase transmission line with unsymmetrical spacing and transposed. Use the flux linkage concept. **(08 Marks)**

c. A three phase transmission line 100 km long has its conductors of 0.5 cm diameter spaced at the corners of an equilateral triangle of 120 cm side. Find the inductance per phase of the system. **(06 Marks)**

6 a. Derive an expression for the capacitance of single phase two-wire lines. (06 Marks)
b. Derive an expression for the capacitance of a 3 phase symmetrical line. (08 Marks)
c. A 3-phase overhead transmission line has 100 km length. The diameter is 0.75 cm. The conductors have been arranged in a horizontal plane with 4 mt distance between conductors. Determine the capacitance of the line, if the line is transposed. (06 Marks)

7 a. Derive an expression for sending end voltage and current of a long transmission line. (10 Marks)
b. Evaluate the ABCD constants for:
(i) Short transmission line
(ii) Medium line nominal T method (10 Marks)

8 a. Discuss in brief various methods of ac distribution system. (06 Marks)
b. Derive the expression for the total voltage drop in a distributor fed at one end with concentrated loading. (08 Marks)
c. A uniformly distributed load on a distributor of length 500 mts is rated at 1A per meter length. The distributor is fed from one end at 220 V. Determine the voltage drop at a distance of 400 mt from the feeding point. Assume a loop resistance of 2×10^{-5} Ω/mt. (06 Marks)

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