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Fourth Semester B.E. Degree Examination, June/July 2023
Transmission and Distribution

Time: 3 hrs.   Max. Marks: 100

Note: *Answer any FIVE full questions, choosing ONE full question from each module.*

Module-1

1 a. Discuss the advantages of high voltages in transmission system. **(08 Marks)**
   b. List the methods of improving string efficiency and explain the use of guard ring for improving string efficiency. **(06 Marks)**
   c. A transmission line conductor having a diameter of 19.5mm weights 0.85kg/m. The span is 275m. The wind pressure is 39kg/m^2 of projected area with ice coating of 13mm. The ultimate strength of the conductor is 8000kg. Calculate the maximum sag if the factor of safety is 2 and ice weights 910kg/m^3. **(06 Marks)**

OR

2 a. With a neat diagram explain feeders, distributor and service main of a distribution system. **(06 Marks)**
   b. Draw the line diagram of a typical power supply scheme indicating the standard voltages. **(06 Marks)**
   c. In a 5 insulator disc string capacitance of each unit and earth is $\frac{1}{6}^{th}$ of the mutual capacitance. Find the voltage distribution across each insulator in the string as a percentage of voltage of conductor to earth. Find also the string efficiency. **(08 Marks)**

Module-2

3 a. Derive an expression for the inductance of a single phase two wire line. **(07 Marks)**
   b. Derive an expression for line to neutral capacitance for a 3 phase overhead transmission line when the conductors are unsymmetrical placed. **(08 Marks)**
   c. The 2cm diameter conductors of a 3-phase 3-wire transmission line are situated at the corners of a triangle of sides 3.5m, 5m and 8m. Find the capacitance per conductor per km. If the line is transposed. **(05 Marks)**

OR

4 a. Write a note on transposition of transmission lines. **(05 Marks)**
   b. Explain the terms self GMD and mutual GMD. **(05 Marks)**
   c. The three conductors of a 3-phase transmission line are arranged in a horizontal plane and are 3 meters apart. The diameters of each conductor is 4cm. Determine the inductance per km of each phase. Assume balanced load and R, Y, B phase sequence. **(10 Marks)**

Module-3

5 a. Explain how transmission lines are classified. **(04 Marks)**
   b. Define voltage regulation of a transmission line. **(04 Marks)**
   c. A 3 phase, 50Hz transmission line, 100km long, delivers 20MW at 0.9 power factor lagging and at 110KV. The resistance and reactance of the line per phase per km are 0.2Ω and 0.4Ω respectively. While the capacitive admittance is 2.5×10^{-6}mho per phase per km.
      Calculate :
      i) Voltage and current at the sending end
      ii) Efficiency of transmission line use nominal – T method. **(12 Marks)**

OR

6 a. Write short notes on Ferranti effect. **(04 Marks)**

b. Two transmission lines having generalized constants A_1, B_1, C_1, D_1 and A_2, B_2, C_2 D_2 are connected in Tandem. Develop expressions for the overall constants A, B, C, D of the combination. **(06 Marks)**

c. A single phase transmission line supplies a load of 1MW at 11KV, 0.8 pf lagging. The resistance and reactance's of the line are 5Ω and 10Ω respectively. Determine :
   i) Sending end voltage
   ii) Efficiency of transmission line
   iii) Percentage regulation. **(10 Marks)**

Module-4

7 a. With reference to corona derive an expression for disruptive critical voltage and visual critical voltages. **(08 Marks)**

b. Derive an expression for insulation resistance of a simple core cable. **(05 Marks)**

c. A 132KV line with 1.956cm diameter conductors are built so that corona takes place if the line voltage exceeds 210KV(rms). If the value of potential gradient at which ionization occurs can be taken as 30KV per cm (peak) then find the spacing between the conductors. Assume 3ϕ transmission system. **(07 Marks)**

OR

8 a. List the advantages and disadvantages of corona. **(06 Marks)**

b. Define grading of cables and explain instersheath grading of cables. **(08 Marks)**

c. For most economical diameter of single core cable to be used on a 132KV, 3-phase system. Find the overall diameter of the insulation the peak permissible stress is not to exceed 60KV/cm. **(06 Marks)**

Module-5

9 a. Explain radial and ring main distributors. **(08 Marks)**

b. Write a note on power quality. **(04 Marks)**

c. A single phase distributor AB is 500m ling and is fed at point 'A' and it is loaded as follows:
   i) 100 A at 0.8 pf lag 200m from A
   ii) 150A at 0.707 pf lag at 500m from A
   The total resistance and reactance of the distributor are 0.2Ω and 0.1Ω per KM respectively. If the receiving end voltage is 400V. Find the sending end voltage and power factor. **(08 Marks)**

OR

10 a. Define :
   i) Reliability
   ii) Availability
   iii) Adequacy
   iv) Security **(08 Marks)**

b. Write a note on limitations of distribution system. **(06 Marks)**

c. Discuss the effect of disconnection of neutral in a 3-phase four wire system. **(06 Marks)**

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