CBCS SCHEME

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21EE51

Fifth Semester B.E. Degree Examination, June/July 2024
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. Explain typical line diagram of transmission and distribution scheme indicating voltage levels used at different stages. **(06 Marks)**

b. Deduce an approximate expression for sag in overhead lines when supports are at unequal levels. **(06 Marks)**

c. An insulator string has 3 units, each having a safe working voltage of 15 kV, the capacitance between each insulator pin and earth is 10% of self capacitance of each insulator. Calculate
i) Maximum safe working voltage of the string ii) String efficiency. **(08 Marks)**

OR

2 a. Explain any two methods to improve the string efficiency. **(06 Marks)**

b. With suitable expression, explain the advantages of high transmission voltage. **(06 Marks)**

c. A transmission line conductor is supported on the towers of unequal heights. The first tower has a height of 30m and the second tower has a height of 50m. The distance between the towers is 150m. Tension in the conductor is 2200 kg and cross section of the conductor is 2 cm^2. The specific gravity of the conductor material 9.5 gm/cm^3 and wind pressure is 150 kg/cm^2. Calculate the sag. **(08 Marks)**

Module-2

3 a. Derive an expression for inductance per phase of a 3-ϕ overhead transmission line when conductors are symmetrically placed. **(08 Marks)**

b. Explain the concept of Self CMD and Mutual GMD. **(06 Marks)**

c. A 3-phase, 50 Hz, 66 kV overhead conductor are placed in a horizontal plane as shown in Fig.Q3(c). The conductor diameter is 1.25cm. The line length is 100 km. Calculate : (i) Capacitance per phase ; (ii) Charging current per phase. Assume complete transposition of the line.

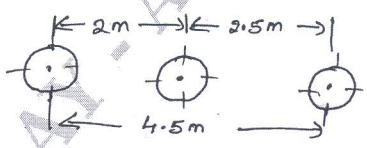

Fig.Q3(c) **(06 Marks)**

OR

4 a. Derive an expression for capacitance of a 3-phase line with unsymmetrical spacing but transposed. **(10 Marks)**

b. The three conductors of a 3-phase line are arranged at the three corners of a triangle of sides 2m, 2.5m and 4.5m. Calculate the inductance per km of the line when conductors are regularly transposed. The diameter of each line conductor is 1.24cm. **(10 Marks)**

Module-3

5 a. Derive an expression for A, B, C, D constant of a medium transmission line, using nominal π method of analysis. Show that AD – BC = 1. **(10 Marks)**

b. A single phase overhead transmission line delivers 1100 kW at 33 kV at 0.8 p.f. lagging. The load resistance and inductive reactance of the line are 100 ohms and 15 ohms respectively. Determine (i) Sending end voltage (ii) Sending end power factor (iii) Transmission efficiency with circuit diagram, with vector diagram. **(10 Marks)**

OR

6 a. Derive the expression for voltage regulation and transmission efficiency of a single phase short transmission line with the help of vector diagram. **(10 Marks)**

b. Find the following for a single circuit transmission line delivering a load of 50 MVA at 110 kV and 0.8 lagging. (i) Sending end voltage (ii) Sending end current (iii) Sending end power (iv) Efficiency of transmission. Given $A = D = 0.93\angle 3^\circ$, $B = 110^\circ\angle 75^\circ\ \Omega$, $C = 0.0005\angle 80^\circ$ siemen. **(10 Marks)**

Module-4

7 a. Explain the phenomenon of corona in overhead transmission line. Also discuss the factor affecting the corona. **(10 Marks)**

b. A single core 66 kV cable has a conductor diameter of 2 cm and a sheath of inside diameter 5.3 cm. The cable has an inner layer of 1 cm thickness of rubber with dielectric constant 4.5 and the rest is impregnated paper with dielectric constant 3.6. Find the maximum stress in each dielectric. **(10 Marks)**

OR

8 a. What are the methods of grading the cable? Explain the capacitance grading of cable. **(10 Marks)**

b. Draw the cross sectional view of single core cable and explain its construction. **(10 Marks)**

Module-5

9 a. Briefly explain the radial and ring main distribution scheme. **(10 Marks)**

b. The Fig.Q9(b) show a two wire distribution system. Calculate the voltage at each load. The resistance of each conductor is 0.03 Ω/km.

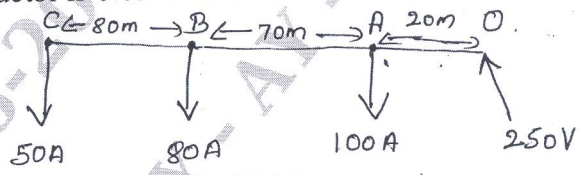

Fig.Q9(b) **(10 Marks)**

OR

10 a. What is Power Quality? What are the different Power Quality problems? **(10 Marks)**

b. Draw the schematic diagram and hence obtain the expressions for voltages at different tappings of a DC distributed fed at one end with concentrated loads. **(10 Marks)**

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