CBCS SCHEME

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21EE51

Fifth Semester B.E./B.Tech. Degree Examination, Dec.2024/Jan.2025
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. Draw the single line diagram of a typical power supply schemes indicating the standard voltages and explain. **(06 Marks)**

b. With usual notations, derive an expression for the sag of a transmission line when the supports are at equal levels. **(06 Marks)**

c. An overhead transmission line at a river crossing is supported from two towers at heights of 40m and 90m above water level , the horizontal distance between the towers being 400m. If the maximum allowable tension is 2000 kg. Find the clearance between the conductor and water at a point midway between the towers. Weight of conductor is 1kg/m. **(08 Marks)**

OR

2 a. Write the methods of improving the string efficiency and explain any two methods. **(07 Marks)**

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

c. Write short notes on the following :
i) Vibration of conductors ii) Stock bridge type vibration damper. **(07 Marks)**

Module-2

3 a. Derive an expression for the inductance of a single phase two wire line. **(06 Marks)**

b. Find the inductance per phase per km of double circuit three phase line shown in Fig. Q3(b). The line is completely transposed. Use GMD method. The radius of the conductor is 9mm. **(08 Marks)**

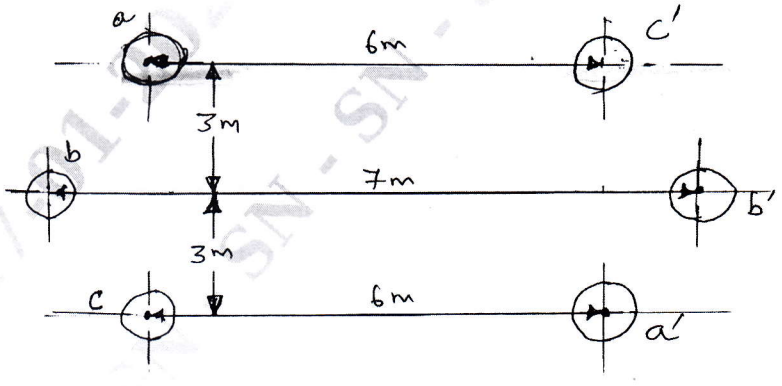

Fig. Q3(b)

c. A 3 – phase, 50Hz, 66KV overhead line conductors are placed in a horizontal plane as shown in Fig. Q3(c). The conductor diameter is 1.25cm. If the line length is 100km. Calculate i) Capacitance per phase
ii) Charging current per phase, assuming complete transposition of the line. **(06 Marks)**

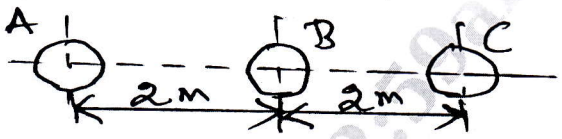

Fig. Q3(c)

OR

4 a. Derive expression for the capacitance per phase of a 3 – phase line with
i) Equilateral spacing ii) Unsymmetrical spacing (single circuit) transposed. **(12 Marks)**

b. Two conductors of a single phase line, each of 1cm diameter are arranged in a vertical plane with one conductor mounted 1m above the other. A second identical line is mounted at the same height as the first and spaced horizontally 0.25m apart from it. The upper and the two lower conductors are connected in parallel. Determine the inductance per km of the resulting double circuit line. **(08 Marks)**

Module-3

5 a. Show how regulation and transmission efficiency are determined for medium transmission line using nominal 'T' method with suitable vector diagram. **(07 Marks)**

b. A 3 phase, 50 Hz, 150km line has a resistance, inductive reactance and capacitive shunt admittance of 0.1Ω , 0.5Ω and 3×10^{-6} S per km per phase. If the line delivers 50 MW at 110 kN and 0.8 p.f lagging, determine the sending end voltage and current. Assume a nominal π circuit for the line. **(09 Marks)**

c. Write a note on Ferranti effect. **(04 Marks)**

OR

6 a. Write a note on classification of transmission lines. **(04 Marks)**

b. Derive an expression for A, B, C, D constants of a long transmission line by rigorous method of analysis. **(08 Marks)**

c. An overhead 3 phase transmission line delivers 5000 KW at 22 KV at 0.8 p.f lagging. The resistance and reactance of each conductor is 4Ω and 6Ω respectively. Determine
i) Sending end voltage ii) Percentage regulation iii) Transmission efficiency. **(08 Marks)**

Module-4

7 a. Explain the phenomenon of corona in an Overhead Transmission line. **(06 Marks)**

b. Explain the following terms with reference to corona :
i) Critical disruptive voltage ii) Visual critical voltage. **(06 Marks)**

c. A single core lead sheathed cable has a conductor diameter of 3cm, the diameter of the cable being 9cm. The cable is graded by using two dielectrics of relative permittivity 5 and 4 respectively with corresponding safe working stresses of 30 KV/cm and 20 KV/cm. Calculate the radial thickness of each insulation and the safe working voltage of the cable. **(08 Marks)**

OR

8 a. Derive the expression for capacitance of a single core cable. **(06 Marks)**

b. Define Grading of cables. Explain capacitance grading. **(08 Marks)**

c. The insulation resistance of a single core cable is 495 MΩ per km. If the core diameter is 2.5cm and resistivity of insulation is 4.5×10^{14} Ω – cm, find the insulation thickness. **(06 Marks)**

Module-5

9 a. Explain Radial and Parallel feeders. **(06 Marks)**

b. With the help of neat sketch, explain Bath tub curve. **(06 Marks)**

c. A single phase distributor 2 kilometers long supplies a load of 120A at 0.8 p.f lagging at its far end and load of 80A at 0.9 p.f lagging at its mid point. Both power factors are referred to the voltage at the far end. The resistance and reactance per km (go and return) are 0.05Ω and 0.1Ω respectively. If the voltage at the far end is maintained at 230V, calculate

i) Voltage at the sending end.

ii) Phase angle between voltages at the two ends. **(08 Marks)**

OR

10 a. Write a note on Power quality. **(06 Marks)**

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

c. Write a note on limitation of distribution system. **(06 Marks)**

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