CBCS SCHEME

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17EE43

Fourth Semester B.E. Degree Examination, Jan./Feb. 2023
Transmission & Distribution

Time: 3 hrs. Max. Marks: 100

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

Module-1

1 a. With a neat diagram, explain feeders, distributor and service main of a distribution system. **(04 Marks)**

b. Explain the advantages of high voltage transmission with suitable expressions. **(08 Marks)**

c. A transmission line conductor at a river crossing is supported from two towers at height of 50 and 80 meters above water level. The horizontal distance between the towers is 300 meters. If the tension in the conductor is 2000 kg. Find the clearance between the conductor and water at a point midway between the towers.
Weight of conductor per meter = 0.844 kg. Assume that the conductor take the shape of parabolic curve. **(08 Marks)**

OR

2 a. Derive the expression for sag in an overhead line conductor by the towers situated at different levels. **(10 Marks)**

b. Each line of a 3-phase system is suspended by a string of 3 similar insulators. If the voltage across the line unit is 17.5 kV. Calculate the line to neutral voltage. Assume that the shunt capacitance between each insulator and earth is $\frac{1}{8}^{th}$ of the capacitance of the insulator itself. Also find the string efficiency. **(10 Marks)**

Module-2

3 a. Derive an expression for the inductance of a single phase two wire line. **(08 Marks)**

b. Explain the concept of self GMD and mutual GMD. **(04 Marks)**

c. A 3 phase, 50 Hz, 132 kV overhead line has conductor placed in a horizontal plane 4 meter apart. Conductor diameter is 2 cm. If the line length is 100 km. Calculate the charging current per phase. Assume complete transposition. **(08 Marks)**

OR

4 a. Derive a expression for the capacitance of a 3 ph overhead line for symmetrical spacing and unsymmetrical spacing. **(10 Marks)**

b. Two conductors of a single phase line each of 1 cm diameter are arranged in a vertical plane with one conductor mounted 1 m above the other. A second identical line is mounted at the same height as the first and spaced horizontally 0.25 m apart from it. The two upper and the two lower conductors are connected in parallel. Determine the inductance per km of the resulting double circuit line. **(10 Marks)**

Module-3

5 a. Derive an expression for sending end voltage and current for long transmission line using rigorous method. **(10 Marks)**

b. Two transmission lines having generalized circuit constants A_1, B_1, C_1, D_1 and A_2, B_2, C_2, D_2 are connected in series. Develop expression for the overall constants ABCD of the combination in terms of A_1, B_1, C_1, D_1 and A_2, B_2, C_2, D_2. **(10 Marks)**

OR

6 a. Explain with vector diagram the nominal π method for obtaining the performance of medium transmission lines. **(10 Marks)**

b. An overhead 3-phase transmission line deliver 5000 kW at 22 KV at 0.8 p.f. lagging. The resistance and reactance of each conductor is 4 Ω and 6 Ω respectively. Determine sending end voltage and transmission efficiency. **(10 Marks)**

Module-4

7 a. Discuss different factors affecting corona and corona loss. **(08 Marks)**

b. A single core lead sheathed cable has a conductor diameter of 3 cm. The diameter of the cable being 9 cm. The cable is graded by using two dielectric of relative permittivity 5 and 4 respectively with corresponding safe working stress 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)**

c. A single core cable has a conductor diameter of 1 cm and insulation thickness of 0.4 cm. If the specific resistance of insulation is 5×10^{14} Ωcm. Calculate the insulation resistance for 2 km length of the cable. **(04 Marks)**

OR

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

b. A 33 KV, 50 Hz, 3-ph 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 is 0.5 cm. Determine : (i) Capacitance of the cable / phase (ii) Charging current / phase (iii) Total charging KVAR. The relative permittivity of insulation is 3. **(06 Marks)**

c. Explain the following terms with reference to corona :
(i) Critical disruptive voltage. (ii) Critical visual disruptive voltage.
(iii) Power loss **(08 Marks)**

Module-5

9 a. Explain radial feeders for AC distribution system. Mention the characteristics of radial feeders. **(06 Marks)**

b. A 3 phase 4 wire system supplies power at 400 V and lighting at 230 V. If the lamps in use require 70, 84 and 33 Ampere in each of the three lines. What should be the current in the neutral wire? If a 3 phase motor is now taking 200 A from the lines at a p.f. of 0.2 lagging. What should be the total current in each line and the neutral wire? Find also the total power supplied to the lamps and the motor. **(10 Marks)**

c. List the limitations of distribution systems. Explain any two in brief. **(04 Marks)**

OR

10 a. Explain 3-phase 4 wire star connected unbalanced loads for AC distribution system. **(06 Marks)**

b. Define power quality. List the quality problems. **(04 Marks)**

c. A single phase AC distribution AB 300 meter long is fed from one end A and is loaded as under,
(i) 100 A at 0.707 p.f. lagging 200 m from point A.
(ii) 200 A at 0.8 p.f. lagging 300 m from point A.
The total resistance and reactance of the distributor is 0.2 Ω and 0.1 Ω per killometer. Calculate the total voltage drop in the distributor. The power factors refer to the voltage at the far end. **(10 Marks)**

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