CBCS SCHEME

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18EE43

Fourth Semester B.E. Degree Examination, Dec.2023/Jan.2024
Transmission and Distribution

Time: 3 hrs. Max. Marks: 100

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

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

Module-1

1 a. Draw a neat single line diagram for a typical transmission and distribution system indicating standard voltages. **(04 Marks)**

b. Define string efficiency. Explain method of improving string efficiency. **(06 Marks)**

c. A transmission line conductor at a river crossing is supported from two towers at heights of 50 and 80 metres above water level. The horizontal distance between the towers is 300 metres. If the tension in the conductor is 2000kg, find the clearance between the conductor and water at a point midway between the towers. Weight of conductor per metre = 0.844 kg/m **(10 Marks)**

OR

2 a. Define Sag. What are the factors that affect Sag? **(04 Marks)**

b. Obtain an expression for sag in over head line conductor supported at different levels on height. **(06 Marks)**

c. In a transmission line, each conductor is at 20 kV. And is supported by a string of 3 suspension insulators. The air capacitance between each cap - pin function and tower is one fifth of the capacitance of each insulator unit. A guard ring, effective only over the line-end insulator unit is fitted so that the voltages on 2 units nearest the line end are equal. Calculate
(i) The voltage on the line end unit.
(ii) The value of capacitance required between the line and the pin. **(10 Marks)**

Module-2

3 a. Define the terms Self GMD and Mutual GMD. **(04 Marks)**

b. With neat diagram obtain an expression for inductance of a 3ϕ over head line with unsymmetrical spacing. **(06 Marks)**

c. One circuit of a single phase transmission line is composed of 3 solid wires each 2.54mm in radius. The return circuit is composed of 2 wires each of 5.08mm radius. The arrangement of conductors is as shown in Fig.Q3(c). Find the inductance due to the current in each side of the line and the inductance of the complete line in millihenry per kilometre length.

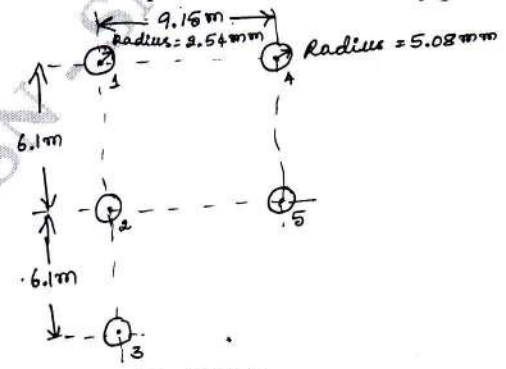

Fig.Q3(c) **(10 Marks)**

OR

4 a. With neat diagram develop an expression for capacitance of a 3ϕ, over head line with symmetrical and unsymmetrical spacing. **(10 Marks)**

b. What is transposition of transmission lines? **(04 Marks)**

c. A 3ϕ double circuit line is shown Fig.Q4(c), find the capacitance per phase to neutral. Diameter of each conductor is 2 cm.

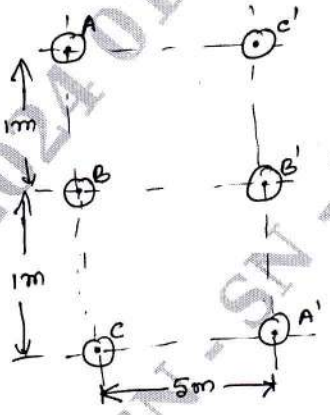

Fig.Q4(c) **(06 Marks)**

Module-3

5 a. Mention the classification of transmission lines and explain with vector diagram the nominal π method for obtaining the performance calculations of medium transmission lines. **(10 Marks)**

b. A 3ϕ, 50 Hz overhead transmission line 100 km long has the following constants. Resistance/km/phase = 0.1 Ω, Inductance reactance/km/phase = 0.2 Ω, Capacitive acceptance /km/phase = 0.4×10^{-14} siemen. Determine
(i) Sending end current (ii) Sending end voltage (iii) Sending end power factor
(iv) Transmission efficiency when supplying a balanced load of 10,000 kW at 66 kV with p.f of 0.8 lagging. Use nominal T method. **(10 Marks)**

OR

6 a. Obtain the generalized circuit constants for
(i) Short transmission line (ii) Medium transmission line – nominal π method. **(10 Marks)**

b. A balanced 3 phase load of 50 MW is supplied at 135 kV, 50 Hz and 0.8 p.f lagging by means of a transmission line. The series impedance of a single conductor is (20 + j50)Ω and the total phase neutral admittance is 310×10^{-6} ℧. Using nominal T method determine
(i) The A, B, C and D constants of the line
(ii) Sending end voltage
(iii) Regulation of the line. **(10 Marks)**

Module-4

7 a. What is corona? What are the factors which effect corona? **(04 Marks)**

b. A 3ϕ , 220kV, 50 Hz transmission line consists of 1.5cm radius conductor spaced 2m apart in equilateral triangle formation. If the temperature is 40°C and atmospheric pressure is 76cm, calculate the corona loss per km of the line. Take $m_0 = 0.85$ and $g_0 = 21.2$ kV/cm (r.m.s). **(06 Marks)**

c. Explain the following terms with reference to corono:
(i) Critical disruptive voltage
(ii) Critical visual disruptive voltage
(iii) Corona Power loss. **(10 Marks)**

OR

8 a. With neat diagram explain the cross-sectional view of a single core cable. **(04 Marks)**

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

c. A 66 kV single core lead sheathed cable is graded by using two dielectrics of relative permittivities 5 and 3 respectively, thickness of each being 1 cm. The core diameter is 2 cm. Determine the maximum stress in the two dielectrics. **(08 Marks)**

Module-5

9 a. What are the requirements of a power distribution system? **(04 Marks)**

b. A two conductor distributor has a length of 700m and is loaded as shown in Fig.Q9(b), the distances being represented in meters. The ends A and B are maintained at 250V and 255V respectively. If the minimum potential allowable at consumer's terminal is 245 V, calculate the diameter of the conductor used. Resistivity is 1.7 micro ohm-cm.

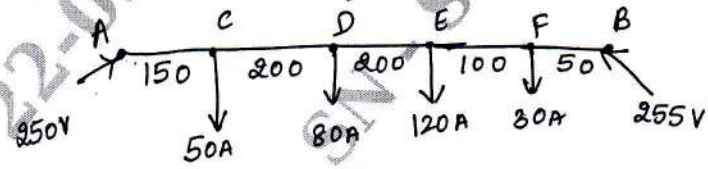

Fig.Q9(b) **(10 Marks)**

c. With neat diagram, explain the concept of A.C distributor with concentrated loads. **(06 Marks)**

OR

10 a. What are the limitations of distribution system? **(04 Marks)**

b. Define the following :

(i) Reliability (ii) Power Quality. **(06 Marks)**

c. Write short notes on Radial and Ring main distribution system. **(10 Marks)**

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