CBCS SCHEME

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17EE43

Fourth Semester B.E. Degree Examination, Aug./Sept.2020
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 the various structures used in overhead transmission lines. **(06 Marks)**

b. Explain how importance of high voltage transmission on:
(i) Volume of conductor (ii) Line losses **(06 Marks)**

c. An overhead transmission line has a span of 200 m between supports at same level. The area of cross-section of conductor is 1.9 cm^2 while the ultimate strength is 5000 kg/cm^2. The specific gravity of the conductor material is 8.9 g/cm. If the conductor is subjected to a wind pressure of 1.5 kg/m. Calculate the sag, if factor of safety is 5. Also calculate the vertical sag. **(08 Marks)**

OR

2 a. Mention different types of insulators. Explain any one with neat figure. **(06 Marks)**

b. Derive the expression for sag in an overhead line conduction by the towers situated at different level. **(06 Marks)**

c. A three-phase overhead transmission line is being supported by three disc connection insulators, the potentials across the first and second insulators are 7 KV and 12 KV respectively. Find: (i) Line voltage (ii) The ratio of capacitance between pin and earth to self capacitance (iii) String efficiency **(08 Marks)**

Module-2

3 a. Derive the expression for a capacitance of a single phase line. **(06 Marks)**

b. Briefly explain skin effect and proximity effect. **(06 Marks)**

c. Two conductors of a single phase line, each of 1 cm 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 0.25 m apart from it. The two upper and lower two conductors are connected in parallel. Determine the inductance/km of the resulting double circuit line. **(08 Marks)**

OR

4 a. Derive the expression for inductance of a 3-phase symmetrically spaced transmission line. **(06 Marks)**

b. A 3-phase circuit 50 Hz line consists of 3 conductors each of diameter 21 mm. The spacing between conductors is as shown in Fig.Q4(b).

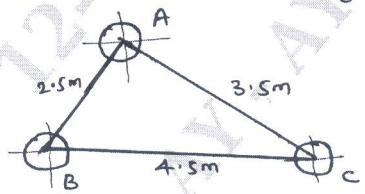

Fig.Q4(b)
diameter of each conductor = 21 mm

Find the capacitance and capacitive reactance/phase/km of the line. The line is transposed at regular intervals. **(06 Marks)**

c. Find the capacitance of a single phase line 40 km long consisting of two parallel wires each 4 mm in radius and 2m apart. Determine the capacitance of the line taking into account effect of ground. The height of conductors above ground is 5m. **(08 Marks)**

Module-3

5 a. Discuss the nominal T-model of medium transmission line with appropriate circuit diagram and phasor diagram and hence obtain the expressions for regulation and ABCD constants for the same. **(10 Marks)**

b. A 3-phase short transmission line delivers 3 MW at a power factor of 0.8 lagging to a load. If the sending end voltage is 33 KV. Determine: (i) Receiving end voltage (ii) Line current (iii) Transmission efficiency (iv) Regulation. The resistance and reactance of each conductor are 5Ω and 8Ω respectively. **(10 Marks)**

OR

6 a. Briefly explain the classification of overhead transmission line. Also define voltage regulation and transmission line efficiency. **(07 Marks)**

b. Write a short note on Ferranti effect. **(05 Marks)**

c. Derive the expression for ABCD parameter constants of a medium transmission using π - method. Show that AD – BC = 1. **(08 Marks)**

Module-4

7 a. Explain the phenamenon of corona in overhead transmission lines. **(06 Marks)**

b. Show that in a single core cable, the ratio of $\frac{g_{max}}{g_{min}} = \frac{D}{d}$ where 'D' is diameter of sheath and 'd' is core diameter. **(06 Marks)**

c. A single core lead covered cable has a conductor diameter of 3 cm with insulation diameter of 8.5 cm. The cable is insulated with two dielectrics of permitivities 5 and 3 respectively. The maximum stresses in two dielectrics are 38 KV/cm and 26 KV/cm respectively. Calculate radial thickness of insulating layers and working voltage of the cable. **(08 Marks)**

OR

8 a. Draw the cross sectional view of a single core cable and explain its construction. **(06 Marks)**

b. A 33 KV, three phase underground cable, 4m long uses 3 single core cables. Each of the conductor has a diameter of 2.5 cm and the radial thickness of insulation 0.5 cm. The relative permittivity of dielectric is 3. Find: (i) Capacitance of cable/phase (ii) Charging current/phase (iii) Total charging KVAR **(06 Marks)**

c. Show that in a cable using two intersheaths the maximum stress in the dielectric reduces by the factor $\frac{1}{\frac{1}{3}(1+\alpha+\alpha^2)}$ of the maximum stress in an ungraded cable, if $\frac{d_1}{d} = \frac{d_2}{d_1} = \frac{D}{d_2} = \alpha$. **(08 Marks)**

Module-5

9 a. What are requirements of good distribution system? **(05 Marks)**

b. What is power quality? What are different power quality problems? **(06 Marks)**

c. A single phase ring distributor is fed at point A. The loads at points B and C are 50 A at 0.6 p.f. lag and 0.8 p.f lag respectively. Both p.f. are with reference to voltage at point A. The impedances of section AB = (1.4 + J1.4)Ω, section BC = (2 + J4)Ω and section CA = (2 +J3)Ω. Find current in each section. **(09 Marks)**

OR

10 a. Write a short note on: (i) Reliability and (ii) Bath tub curve. **(06 Marks)**

b. What are the limitations of distribution system? **(06 Marks)**

c. A single phase distributor, 1 km long has a resistance and reactances of 0.4Ω and 0.6Ω (go and return) respectively. The voltage at the far end is V_C = 230 V and the current at C is 100 A at a p.f of 0.8 lag. At the midpoint B of the distributor, a current of 100 A at a p.f of 0.6 lag with reference to the voltage V_B. Calculate the supply voltage V_A and phase angle between sending end A and receiving (far) end C. **(08 Marks)**