17EE43

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

Time: 3 hrs.　　　　　　　　　　　　　　　　　　　　　　　Max. Marks: 100

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

Module-1

1　a. Explain with help of a neat diagram the typical transmission and distribution s/s scheme. **(06 Marks)**

　b. A transmission line conductor at a river crossing is supported from two towers of height 50 and 8m mtrs above ground level. The horizontal distance between the towers is 300mtrs. 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 conductors is 0.844Kg/m. **(08 Marks)**

　c. Discuss the advantages of High voltage transmission. **(06 Marks)**

OR

2　a. Derive an expression for the sag when the supports are at equal height. **(07 Marks)**

　b. Define string efficiency? List the methods of improving string efficiency and explain any one method. **(07 Marks)**

　c. An insulator string has 3 units, each having a safe working voltage of 15kV. 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. **(06 Marks)**

Module-2

3　a. Derive an expression for the inductance of a single phase two wire line. **(07 Marks)**

　b. Find the capacitance of a single phase line 40km long consisting of 2 parallel wires each 4mm is radius and 2m apart. Determine the capacitance of the same line taking into account effect of ground. The height of conductors above ground is 5m. **(07 Marks)**

　c. A two conductor single phase line operates at 50Hz. The diameter of each conductor is 20mm and spacing between the conductors is 3m. calculate:
　　i)　Inductance of each conductor per ken
　　ii)　The loop inductance of the line/km.
　　iii)　The inductive reactive/km. **(06 Marks)**

OR

4　a. Derive an expression for capacitance of a 3-ϕ line with equilateral spacing. **(08 Marks)**

　b. Find the capacitance of a single phase line 40km long consisting of 2 parallel wires each 4mm in radius and 2m apart. Determine the capacitance of the same line taking into account effect of ground. The height of conductors above grand is 5m. **(06 Marks)**

　c. A 3 - ϕ transmission line 100km long has its conductors of 0.6m diameter spaced at the comers of an equilateral triangle of 100cm side. The arrangement is as shown in Fig Q4(c). Find the inductance per phase of system.
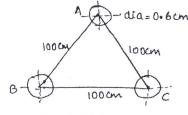

Fig Q4(c)　　　　　　　　　　　　　　　　　　　　　　　**(06 Marks)**

Module-3

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

b. A 3 - ϕ transmission line is 400km long and caters a load of 450MVA, 0.8pf lag at 345kV. The ABCD constants are A = D = 0.8181 $\underline{|1.3°}$ B = 172.2 $\underline{|84.2°}$ C = 1.933 × 10^{-3} $\underline{|90.4°}$ mho sending end current and percentage voltage drop at full load. Also calculating receiving end line to neutral voltage at no-load. Calculate the sending end line to neutral voltage **(06 Marks)**

c. Discuss the classification of overhead transmission line. **(04 Marks)**

OR

6 a. Explain with vector diagram the nominal π-method for obtaining the performance of medium transmission line. **(06 Marks)**

b. A 3-ϕ, 50Hz overhead transmission line 100km long has the full constant : Resistance/km/phase = 0.1Ω, inductance Reactance/km/phase = 0.2Ω, capacitive susceptance/km/ph = 0.4 × 10^{-14} Siemens. Determine :
i) Sending end current ii) Sending end voltage iiii) Sending end power factor iv) Transmission efficiency where supplying a balanced load of 10,000kW at 66kV with pf of 0.8 lagging. Use nominal T-method. **(06 Marks)**

c. Define the terms related to performance of transmission line
i) voltage regulation ii) efficiency **(08 Marks)**

Module-4

7 a. Discuss the factor affecting corona and corona loss. **(06 Marks)**

b. A 3-ϕ, 220kV, 50Hz transmission line consists of 1.5cm radius conductor spaced 2 metre apart in equilateral triangular 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 = 21.2kV/cm. **(06 Marks)**

c. Derive expression for the capacitance of single core cable. **(08 Marks)**

OR

8 a. Explain with respect to corona i) Critical disruptive voltage ii) Visual critical voltage. **(06 Marks)**

b. Explain capacitance grading. **(08 Marks)**

c. A concentric cable has a core diameter of 0.8cm. The sheath diameter is 3.2cm. if the cable is tested with a voltage of 33kV, calculate maximum and minimum stress in the insulation. **(06 Marks)**

Module-5

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

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

c. Write a note of Power Quality. **(06 Marks)**

OR

10 a. Explain secondary distribution system :
i) 3 - ϕ distribution ii) 1- ϕ 2 – wire system. **(07 Marks)**

b. Write a note on limit of distribution system **(06 Marks)**

c. Explain Ring main feeder in Distribution system. **(07 Marks)**

* * * * *