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P.E.S. College of Engineering, Mandya - 571 401

(An Autonomous Institution affiliated to VTU, Belagavi)

Fifth Semester, B.E. - Electrical and Electronics Engineering

Semester End Examination; Dec. - 2019

Power Transmission and Distribution

Time: 3 hrs *Max. Marks: 100*

***Note**: Answer **FIVE** full questions, selecting **ONE** full question from each unit.*

UNIT - I

1 a. Draw the typical line diagram layout of transmission and distribution systems scheme indicating the standard voltages. 5

b. List out the various systems of transmission of electrical power. 5

c. What is sag? Develop the equation for sag, when the conductor is supported between two poles at the same level. 10

2 a. Develop the necessary expression for the effect of HVAC transmission on;

i) Volume of the conductor material required

ii) Transmission efficiency

iii) Line drop or line regulation 8

b. Write a short note stringing chart and its application. 4

c. An overhead conductor having an ultimate strength of 8000 kg/cm^2 and an area of 2 cm^2 is erected between supports placed 600 m apart and having a level difference of 15 m. If the minimum ground clearance is to be 40 m, find the tower heights. The conductor is subjected to a horizontal wind pressure of 1.54 kg/m. The self-weight of the conductor is 1.75 kg/m. Assume a safety factor of 4. 8

UNIT - II

3 a. Define the string efficiency and explain the methods of improving string efficiency. 10

b. A single core cable employing three layers of insulation with dielectric constants $\varepsilon_{r1} = 5$, $\varepsilon_{r2} = 4$ and $\varepsilon_{r3} = 3$ respectively has a conductor of radius 1 cm. Assuming that all the three insulating materials are worked at the same maximum potential gradient, workout the potential difference in kV between the core and earthed sheath. The inner radius of the sheath is 2.5 cm and the maximum potential gradient is 40 kV/cm. 10

4 a. Derive and analyze an expression for potential distribution over a string of three disc suspension insulators and string efficiency and show that the voltage distribution across the units of a string insulator is not uniform. 8

b. Derive and analyze an expression for stress distribution for different methods of grading of cable. 12

Contd….2

UNIT - III

5 a. Develop and analyze an expression for inductance (Internal flux and External flux) of a single phase two wire system. 10

b. Develop and analyze an expression for capacitance of three phase overhead line with unsymmetrical spaced line. 10

6 a. Develop and analyze an expression for inductance of three phase overhead line with unsymmetrical spaced line with transposed. 7

b. Develop and analyze an expression for capacitance of three phase overhead line with un-symmetrical spaced line with transposed. 7

c. A single three phase line operated at 50 Hz, distance between conductor is arranged as $d_1 = d_3 = 2$ m, and $d_2 = 3$ m, the conductor diameter is 0.6 m, evaluate the inductance per kilo-meter and capacitance per kilo-meter. 6

UNIT - IV

7 a. Derive and analyze an expression for ABCD parameters for a medium line represented by nominal (pai) Π method. Also draw the Phasor diagram. 10

b. A three phase, 50 Hz overhead transmission line has the following constants:

Resistance = 28 Ω, Inductive reactance = 63 Ω and capacitive susceptance = 4×10^{-4} ʊ.

If the load at receiving end is 75 MVA at 0.8 power factor lagging with 132 kV between lines, evaluate; 10

i) Voltage

ii) Current

iii) Power factor at sending end

iv) Regulation

v) Efficiency of transmission for this load using nominal T-method

8 a. Derive and analyze an expression for ABCD parameter for a medium line represented by nominal 'T' method. Also draw the Phasor diagram. 10

b. A three phase, overhead transmission line has 110 kV between line at receiving end and the following constants:

Resistance/km/phases = 0.153 Ω, Inductive reactance/km/phase = 1.21 mH,

Capacitance = 0.00958 μF. 10

The lines supply a load of 20.000 kW at 0.9 PF lagging. Evaluate;

i) Voltage ii) Current

iii) Power factor at sending end iv) Regulation

v) Efficiency of transmission for this load using nominal-Π method.

Contd….3

UNIT - V

9 a. How is distribution system classified? Explain. 7

b. A Dc two-line distributor F_1 F_2 is fed at both ends at same voltage of 220 V. The length of distributor is 250 m and loads tapped off from the end F_1 are: 8

Distance in meter	50	75	100	150
Load in amps	10	40	30	25

The resistance per kilometer of both distributor is 0.2 Ω. Evaluate;

i) The current in each section

ii) The voltage of each load point

c. Explain types of distributers. 5

10 a. Derive the expression for AC distributors with concentrated loads referring power factor, 10

i) Power factor referred to receiving and voltage

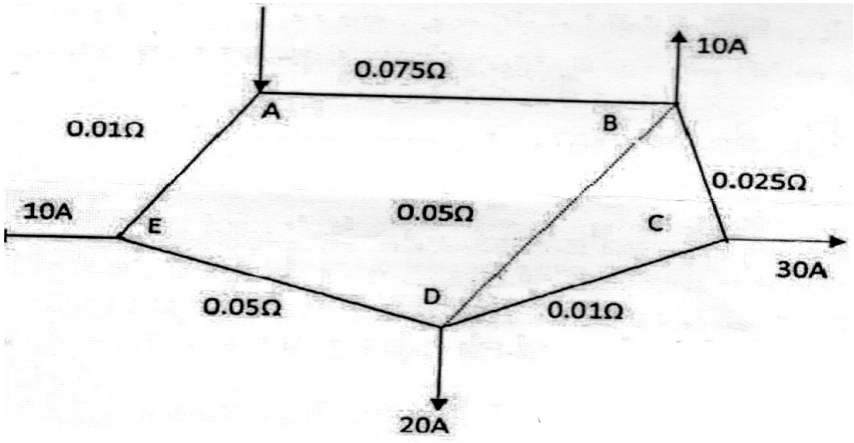
ii) Power factors refereed to respective load voltage

b. The points 'B' and 'D' of a DC ring main ABCDEA are linked through an interconnector. The supply is given at point 'A' The resistance of 20 and return conductor of sections are shown in the figure. Estimate; 10

i) Current in interconnector

ii) Voltage drops in the interconnector

iii) Current fed at point 'A'



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