5E 5045

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B. Tech. V Semester (Main/Back) Examination, Dec.. 2014

ELECTRICAL ENGINEERING # 5EE5A

Transmission & Distribution of Electrical Power

Time : 3 Hours | Min. Passing Marks : 24 | Maximum Marks : 80

Instruction to Candidates :

*Attempt any **five** questions, selecting **one** question from **each** unit. All questions carry **equal** marks. (Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used/calculated must be stated clearly.)*

Unit–'I'

1. (*a*) Explain the radial and ring main distribution system. [8]

(*b*) A 3 phase ring distributor ABCD fed at A 11kV supplies balanced loads of 40A at 0.8pf lagging at B 50A, .707pf lagging at C and 30 A at 0.8pf lagging at D, the total load currents being referred to the supply voltage at A. The impedances per phase of the various sections are Section AB = (1 = j2) Ω, section BC = (2 + j3) Ω, section CD = (1 + j1) Ω, section DA = 3 + j4) Ω. Calculate the currents in various sections and station bus bar voltages at B, C and D. [8]

OR

1. (*a*) Draw and explain the structure of electrical power system indicating the voltage level in each transmission levels. [8]

(*b*) A two wire distribution system AB 600m long is fed at both ends at 220V. Loads of 20A, 40A, 50A and 30A are tapped at distances of 100m, 250m, 400 m and 500m from the end A respectively. If the area of cross – section of distributor conductor is 1 cm^2. Find the minimum consumer voltage. Take $\rho = 1.78 \times 10^{-8}$ Ωm. [8]

Unit–'II'

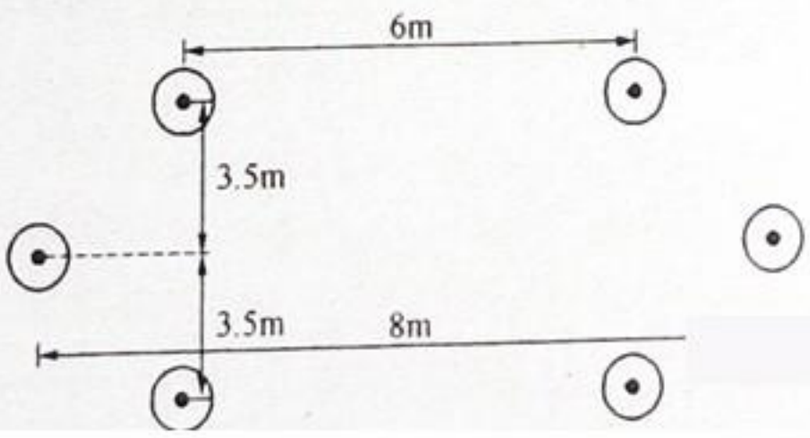
2. (*a*) An overhead line has a span of 160m of stranded copper conductor between level supports. The sag is 3.96 meter at – 5.50 C with 9.53 mm thick in ice coating and wind pressure of 40 $Kgfm^2$ of projected area. Calculate the temperature at which the sag will remain the same under conditions of no ice and no wind. The particulars of the conductor are as follows : [10]
Size of conductor 7/3.45 mm. Area of cross section 64.5 mm^2 weight of conductor 0.594 kgf/m. Modulus of elasticity 12700 Kgf/mm^2. Coefficient of linear expression 1.7 × 10 – 510 C. Assume 1 ms of ice to weight 913.5 Kgf.

(*b*) Derive an expression for sag of a line supported between two supports of same height. [6]

OR

2. (*a*) What is meant by disruptive critical voltage and visual critical voltage? State the effects of conductor size, spacing and condition of the surface of conductors on these voltages. [8]

(*b*) Calculate the capacitance per phase of a three – phase double circuit line as shown in below Figure. The diameter of the conductor is 2.2cm. Assume that the line is completely transposed. [8]



Unit–'III'

3. (*a*) Explain about skin and proximity effects. [6]

(*b*) Deduce an expression for capacitance of three phase transmission line with unsymmetrical spacing (Transposed conductors). [10]

OR

3. (*a*) Starting from first principles derive an expression for the sending end voltage and current of a long transmission line in terms of the line parameters and receiving end voltage and current. [10]

(*b*) Derive the capacitance of a three – phase overhead line. [6]

Unit–'IV'

4. (*a*) A 50Hz three phase transmission line is 250km long. It has a total series impedance of (20 + j60) ohms and a shunt admittance of 914 × 10^{-6} mhos. It delivers 50MW, 220kV with 0.85 power factor lagging. Find the [8]
(i) Sending end voltage,
(ii) Voltage regulation and
(iii) Transmission efficiency by nominal–T method

(*b*) Explain the various factors affecting the corona loss. [8]

OR

4. (*a*) Derive the expression for the voltage induced in communication lines due to the current in power lines. [8]

(*b*) Estimate the corona loss for a three – phase, 110 Kv, 50 Hz, 150 Km – long transmission line consisting of three conductors each of 10mm diameter and spaced 2.5 m apart in a equilateral triangle formation. The temperature of air is 30°C and the atmospheric pressure is 750 mm of mercury. Assume the irregularity factor as 0.85. Ionization of air may be assumed to take place at a maximum voltage gradient of 30Kv/cm. [8]

Unit–'V'

5. (*a*) Draw with neat sketches and explanation of pin and suspension type insulators. Compare their merits and demerits. [8]

(*b*) Explain any two methods of grading of cables with necessary diagrams. [8]

OR

5. (*a*) A 3 phase overhead transmission line is being supported by three disc insulators. The potentials across top unit and middle unit are 9kV and 11kV respectively. Calculate : [8]
(i) The ration of capacitance between pin and earth to the self – capacitance of each unit.
(ii) The line voltage
(iii) String Efficiency

iagrams explain constructional features of various types of cables. [8]