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NEW SCHEME

Fifth Semester B.E. Degree Examination, Dec. 06 / Jan. 07
Electrical and Electronics Engineering
Electrical Power Transmission and Distribution

Time: 3 hrs.] [Max. Marks:100

Note: ***Answer any FIVE full questions.***

1 a. What are the advantages of high voltage ac transmission? **(05 Marks)**

b. Derive the expression for sag in over-head conductors for conductors at different levels. **(07 Marks)**

c. Two towers of height above water level 95 m and 70 m respectively support the line conductors at a river crossing. The horizontal distance between towers is 400 m. If the tension in the conductor is 1100 kg and its weight is 0.8 kg/m, calculate: i) Sag at lower support ii) Sag at upper support iii) Clearance of the lowest point on the trajectory from water level. **(08 Marks)**

2 a. Explain the terms Self GMD and Mutual GMD. **(05 Marks)**

b. Calculate the inductance of each conductor in a 3 phase – 3 wire system. Conductors are arranged in a horizontal plane with spacing $d_{31} = 4$ m, $d_{12} = d_{23} = 2$ m as shown in fig.2(b). The conductors are transposed and have a diameter of 2.5 cm. **(08 Marks)**

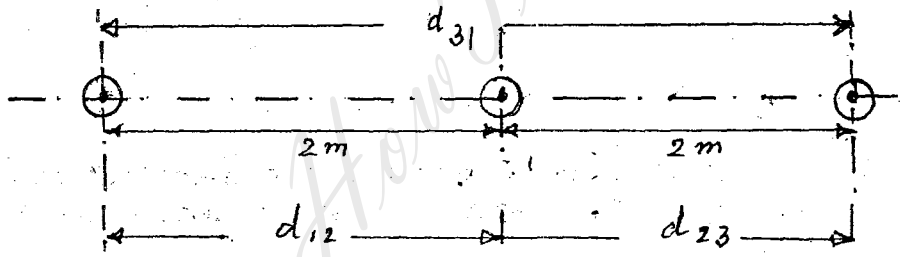

Fig.2(b)

c. The three conductors of a 3 phase line are arranged at the corners of a triangle of sides 2, 2.5 and 4.05 m respectively as shown in fig.2(c). Calculate the inductance per km of the line if the conductors are regularly transposed. The diameter of each conductor is 1024 mm. **(07 Marks)**

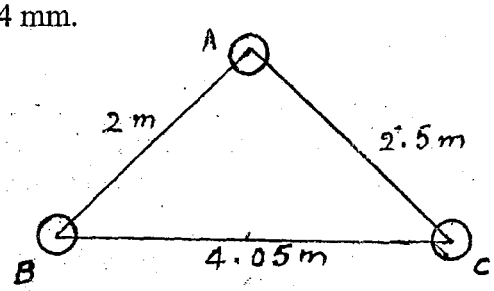

Fig.2(c)

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3 a. Obtain the capacitance of a 3 phase line with unsymmetrical spacing. Assume lines are transposed. **(08 Marks)**

b. Determine the capacitance of and charging current per km when the transmission line as shown in fig.3(b) is operating at 132 kV. The conductor diameter is 0.8 cm. **(07 Marks)**

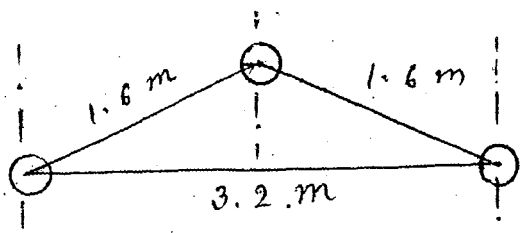

Fig.3(b)

c. A 3 phase 50 Hz, 66 kV overhead line conductor system the conductors are placed in a horizontal plane as shown in the fig.3(c). The conductor diameter is 1.25 cm. If the line length is 100 km. Calculate i) Capacitance per phase ii) Charging current/phase assuming complete transposition of the line. **(05 Marks)**

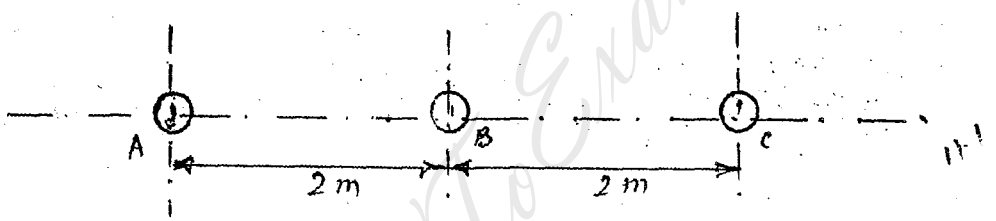

Fig.3(c)

4 a. What are generalized circuit constants of a transmission line? Determine the ABCD constants of a medium transmission line using nominal T – Model and prove AD-BC = 1. **(10 Marks)**

b. A balanced 3 phase load of 50 MW is supplied at 132 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) Ohms and the total phase neutral admittance is 310 X 10^{-6} Mho. Using nominal T-method determine: i) ABCD constants of the line ii) Sending end voltage and iii) Regulation of the line. **(10 Marks)**

5 a. What is string efficiency? What are the methods of improving string efficiency? **(05 Marks)**

b. A 3 phase overhead transmission line is supported by 3 suspension type insulators. The potential across the first and second insulators being 8 kV and 11 kV respectively. Calculate i) Line voltage ii) Ratio of self to shunt capacitance iii) String efficiency. **(07 Marks)**

c. A string of 5 suspension insulators is to be graded to obtain uniform distribution of voltage across the string. If the pin to earth capacitances are all equal to C and the neutral capacitance of the top unit is 12 C, find the mutual capacitance of each unit in terms of C. **(08 Marks)**

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6 a. State five advantages of using underground cables for power distribution. **(05 Marks)**

b. Derive an expression for insulation resistance of a cable. **(07 Marks)**

c. A single core cable has a conductor of diameter 1.2 cm and its insulation thickness is 1.6 cm. The specific resistance of the insulating material is 7.5 X 10^8 MΩcm. Calculate the insulation resistance per kilometer of the cable. If now this resistance is to be increased by 20% calculate the thickness of the additional layer of insulation required. **(08 Marks)**

7 a. What are the advantages and disadvantages of radial distribution system? **(05 Marks)**

b. Four lines A, B, C and D are connected to a common point O as shown in fig.7(b). Resistance of AO, BO, CO and DO are respectively 1, 2, 3 and 4 Ohms both go and return and feeding points A, B, C and D are maintained at 230, 250, 240 and 220 V respectively. Find the potential of common point O assuming no load is tapped from there. **(07 Marks)**

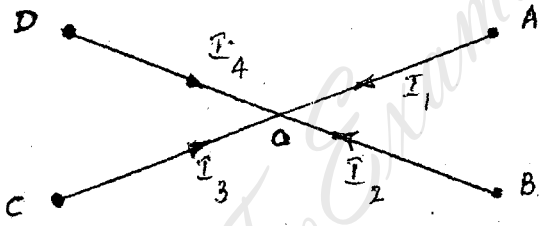

Fig.7(b)

c. Determine the critical disruptive voltage and the critical visual disruptive voltage for a 3 phase, 50 Hz, 132 kV line situated in a temperature of 30 degree centigrade and at a barometric pressure of 74 cm. The conductor diameter is 1.5 cm while the equilateral spacing between the conductors is 2.75 m. The surface irregularity factors are 0.9 and 0.75 for the critical disruptive voltage and the critical visual disruptive voltage respectively. **(08 Marks)**

8 Write short notes on any four of the following:

a. Ferranti effect.

b. Corona in transmission lines.

c. Stringing chart.

d. Grading of cables.

e. Skin effect. **(20 Marks)**

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