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EE53

Fifth Semester B.E Degree Examination, Dec. 07 / Jan. 08
Electrical Power Transmission and Distribution

Time: 3 hrs. Max. Marks:100

Note : *Answer any FIVE full questions.*

1 a. What are the advantages and limitations of high voltage AC transmission? **(06 Marks)**

b. From the first principles derive the expression for the sag in overhead lines when the supports are at unequal level. **(06 Marks)**

c. An overhead transmission line at a river crossing is supported from two towers at height of 40m and 90m above water level, the horizontal distance between the towers being 400m. If the maximum allowable tension is 2000kg, find the clearance between the conductor and water at a point mid-way between the towers. Weight of conductor is 1kg/m. **(08 Marks)**

2 a. Obtain the inductance of single phase two wire line starting from fundamentals. **(08 Marks)**

b. The three conductors of a 3ϕ line are arranged at the corners of a triangle of sides 2,2.5 and 4.5m respectively as shown in fig.2(b). Calculate the inductance per km of the line if the conductors are regularly transposed. The diameter of each conductor is 1.24cm. **(07 Marks)**

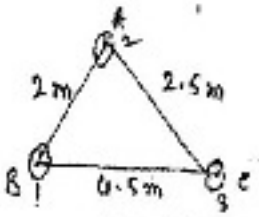

Fig.2(b)

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

3 a. What is ferranti effect and skin effect? Explain. **(06 Marks)**

b. Derive an expression for the line to neutral capacitance of 3ϕ overhead transmission line, when the conductors are symmetrically placed. **(08 Marks)**

c. A 3ϕ, 50Hz, 132 kV overhead line has conductors placed in a horizontal plane 4m apart. Conductor diameter is 2cm. If the length of line is 100km, calculate the charging current per phase assuming complete transposition. Given $\in_0 = 8.854 \times 10^{-12}$. **(06 Marks)**

4 a. Deduce an expression for voltage regulation and transmission efficiency of a 1ϕ short tr. Line, giving the vector diagram. **(06 Marks)**

b. A single phase over head transmission line delivers 1100 kW at 33 kV at 0.8 pf lagging. The total resistance and inductive reactance of the line are 10Ω and 15Ω respectively. Determine. i) Sending end voltage ii) Sending end power factor iii) Transmission efficiency with circuit and vector diagram. **(10 Marks)**

c. Determine the sending end voltage and sending end current for medium transmission lines, assuming nominal π method. **(04 Marks)**

5 a. Why are insulators used with overhead lines? Discuss the desirable properties of insulators and name the types of insulators. **(06 Marks)**

b. Define string efficiency and explain the methods of improving string efficiency. **(06 Marks)**

c. In a 33 kV overhead line, there are three units in the string of insulators. If the capacitance between each insulator pin and earth is 11% of self capacitance of each insulator, find i) the distribution of voltage over 3 insulators and ii) string efficiency. **(08 Marks)**

6 a. What is meant by grading of cables? Explain the capacitance grading. **(07 Marks)**

b. A single core cable of conductor diameter 2cm and lead sheath of diameter 5.3cm is to be used on a 66kV, 3ϕ systems. Two inter sheaths of diameter 3.1cm and 4.2cm are introduced between the core and lead sheath. If the maximum stress in the layers is the same, find the voltages on the inter sheaths. **(08 Marks)**

c. What are the advantages of using under ground cables compared to over head transmission lines? **(05 Marks)**

7 a. Explain the following terms with reference to corona i) Critical disruptive voltage ii) Visual critical voltage iii) Power loss due to corona. **(07 Marks)**

b. A 3 – phase, 220 kV, 50 Hz transmission line consists of 1.5cm radius conductor spaced 2 meter apart in equilateral triangular formation. If the temperature is 40^0C and atmospheric pressure is 76cm, calculate the corona loss per km of the line. Take $m_0 = 0.85$ and $g_o = 21.2$ kV/cm (rms). **(06 Marks)**

c. How d.c. distributors are classified? Write the advantages of radial distribution system over other types of systems. **(07 Marks)**

8 Write short notes on any four :

a. Typical a.c. power supply scheme.

b. Effect of ice loading and wind effect on sag of transmission line.

[illegible] distribution system