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06EE53

Fifth Semester B.E. Degree Examination, May/June 2010
Transmission and Distribution

Time: 3 hrs. Max. Marks:100

Note: ***Answer any FIVE full questions, selecting at least TWO questions from each part.***

PART – A

1 a. Give reasons : **(10 Marks)**

i) The transmission lines are 3 phase, 3 wire circuits while distribution lines are 3 phase, 4 wire circuits.

ii) It is necessary to use high voltages for transmission systems.

iii) At 400 KV and above the transmission lines have bundled conductors.

iv) Corona loss is more in stormy weather than during fair weather.

v) The disruptive critical voltage for a rough conductor is less than that for smooth conductor of the same radius.

b. Bring out the relative advantages and disadvantages of overhead and underground systems. **(04 Marks)**

c. Explain 'Corona', its advantages and disadvantages. **(06 Marks)**

2 a. List the main components of overhead lines and explain them briefly. **(04 Marks)**

b. Derive an expression for sag of a overhead line supported between two supports of the same height, assuming that the conductor takes the shape of a catenary. **(08 Marks)**

c. A transmission line conductor crossing a river in supported from two towers at heights 30 m and 80 m above the water level. The horizontal distance between the two towers is 450 m. If the tension in the conductor is 1500 kg and weight of the conductor is 1.4 kg/m length, find the minimum clearance of the conductor and water and the clearance midway between the supports. **(08 Marks)**

3 a. Discuss why :

i) The voltage distribution across the units of a string insulator is not uniform.

ii) Insulators are often fitted with arcing horns.

iii) Transmission lines in heavily polluted area are provided with greater number of insulators discs.

iv) Provision of a grading ring improves the string efficiency. **(08 Marks)**

b. Write a note on insulator failure. **(04 Marks)**

c. A suspension string has three units. Each unit can withstand a maximum voltage of 11 kV. The capacitance of each joint and metal work is 20% of the capacitance of each disc. Find:

i) Maximum line voltage for which the string can be used

ii) String efficiency. **(08 Marks)**

4 a. State the classification of cables according to voltage and discuss their general construction. **(06 Marks)**

b. Derive the expression for the capacitance of a single core cable and also give the expression for maximum and minimum dielectric stress. **(06 Marks)**

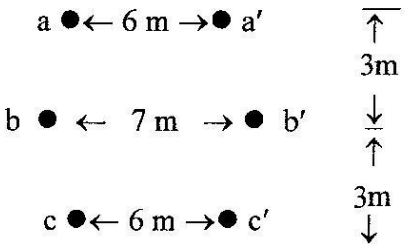
c. A 66 KV 3-ϕ system uses a single core cable of diameter 2 cm and lead sheath of diameter 5.3 cm. Two inter sheath of diameter 3.1 cm and 4.2 cm are introduced between the core and lead sheath. If the maximum stress in the layers is the same, find the voltages on the inter sheath. **(08 Marks)**

PART – B

5 a. Explain the terms self GMD and mutual GMD. **(04 Marks)**

b. Obtain the inductance of a single phase two wire line, starting from fundamentals. **(06 Marks)**

c. Find the inductance per phase per km of line length of a 3-ϕ double circuit line shown below. The radius of each conductor is 0.9 cm. **(10 Marks)**



6 a. Explain the 'Ferranti affect' in long transmission lines. **(04 Marks)**

b. Derive the expression for ABCD parameters of a medium transmission line by π method. Draw the vector diagram. **(06 Marks)**

c. A 3-ϕ 50 Hz overhead transmission line 100 km long has the following constants: Resistance/km = 0.3 Ω, reactance/km = 1.0 Ω, susceptance/km = 6×10^{-6} $\mho$. The line voltage at the receiving end = 132 KV. The transmission line is delivering 50 MVA at 0.85 p.f. lag at the receiving end. Using T method, calculate:

i) Send end current ii) Sending end line voltage iii) Sending p.f.

iv) Voltage regulation v) Transmission efficiency **(10 Marks)**

7 a. Bring out the differences between:

i) Feeders, distributions and service mains

ii) Radial system and ring systems. **(06 Marks)**

b. What are the requirements of a good distribution system? **(04 Marks)**

c. A two wire D.C distributor cable AB is 2.2 km long and supplies loads of 25 A, 50 A, 75 A, at 0.4 km, 1 km and 1.6 km from the point A. Each conductor has a resistance of 0.05 Ω/km. Calculate the potential difference at each point, if the potential difference of 400 V is maintained at point A. **(10 Marks)**

8 Write short notes on : **(20 Marks)**

a. Grading of cables.

b. Bundled conductors.

c. Charging current and its effects.

d. Galloping or dancing conductors.

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