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NEW SCHEME

Fifth Semester B.E. Degree Examination, July 2006
Electrical and Electronics Engineering
Electrical Power Transmission and Distribution

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

Note: 1. ***Answer any FIVE full questions.***

1 a. Explain the effects if sag in overhead transmission line. **(05 Marks)**

b. Derive an expression for sag in a power conductor between two supports at equal heights taking into the effect of wind and ice loading. **(07 Marks)**

c. An OH line has a span of 150 m between level supports. The conductor has a cross-sectional area of 2 cm^2. The ultimate strength is 5000 kg/cm^2 and safety factor is 5. The specific gravity of the material is 8.9 gm/cc. The wind pressure is 1.5 kg/m. Calculate the height of the conductor above the ground level at which it should be supported if a minimum clearance of 7 m is to be left between the ground and the conductor. **(08 Marks)**

2 a. Derive from first principles, an expression for the inductance per phase per km of a 3 phase regularly transposed transmission line. The conductors are of diameter 'd' meter and placed at the corners of a triangle of sides a, b & c. **(10 Marks)**

b. 2 conductors of a single phase line, each of 1 cm diameter are arranged in a vertical plane with one conductor mounted 1 m above the other. A second identical line is mounted at the same height as the first and spaced horizontally 0.25 m apart from it. The two upper and the two lower conductors are connected in parallel. Determine the inductance per km of the resulting double circuit line. **(10 Marks)**

3 a. Derive an expression for the capacitance of a 3 phase unsymmetrical but regularly transposed line. **(10 Marks)**

b. Find the capacitance of a single phase line 40 km long consisting of 2 parallel wires each 4 mm in dia and 2 m apart. Determine the capacitance of the same line taking into account, effect of ground. The height of conductors above ground is 5 m. **(10 Marks)**

4 a. Derive expressions for the generalized A, B, C, D constants for equivalent T-representation of long line. **(08 Marks)**

b. Discuss the terms voltage regulation and transmission efficiency as applied to transmission line. **(04 Marks)**

c. A 3 phase, 50 Hz overhead transmission line 100 km long has the following constants: Resistance / km / phase = 0.1 Ω, Inductive reactance / km / phase = 0.2 Ω, Capacitive Susceptance / km / ph = 0.04×10^{-4} s. Determine

i) The sending end current
ii) Sending end voltage
iii) Sending end power factor and
iv) Transmission efficiency

When supplying a balanced load of 10,000 KW at 66 KV, P_f = 0.8 lag. Use nominal T method. **(08 Marks)**

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5 a. Discuss the advantages and disadvantages of Corona. **(06 Marks)**

b. Explain the terms with reference to Corona.

i) Critical disruptive voltage

ii) Power loss due to Corona. **(04 Marks)**

c. A 132 KV, 3 phase line with 1.956 cm dia conductors is built so that Corona takes place, if the line voltage exceeds 210 KV (rms). If the value of potential gradient at which ionization occurs can be taken as 30 KV per cm, find the spacing between the conductors. **(10 Marks)**

6 a. Derive expressions for the maximum and minimum dielectric stress in a single core cable and obtain the criterion for keeping the dielectric stress to a minimum value. **(06 Marks)**

b. Compare the merits and demerits of under ground system against over head system. **(06 Marks)**

c. Each line of a 3 phase system is suspended by a string of 3 similar insulators. If the voltage across the line unit is 17.5 KV, calculate the line to neutral voltage. Assume that the shunt capacitance between each insulator and earth is $\frac{1}{8}^{th}$ of the capacitance of the insulator itself. Also find the string efficiency. **(08 Marks)**

7 a. Show different types of distribution systems with single line diagrams and state the merits and demerits of radial and ring main distribution systems. **(10 Marks)**

b. A single core lead sheathed cable has a conductor diameter of 3 cm; the diameter of the cable being 9 cm. The cable is graded by using two dielectrics of relative permittivity 5 and 4 respectively, with corresponding safe working stresses of 30 KV/cm and 20 KV/cm. Calculate the radial thickness of each insulation and the safe working voltage of the cable. **(10 Marks)**

8 Write short notes on any four :

a. H.V.D.C transmission

b. Stringing chart

c. Ferranti effect

d. Feeders, distributors and service mains

e. Different types of O.H. line insulators.

f. PV and QV coupling. **(20 Marks)**

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