NEW SCHEME

EE53

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Fifth Semester B.E. Degree Examination, July/August 2005

Electrical & Electronics Engineering

Electrical Power Transmission & Distribution

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

Note: *1. Answer any FIVE full questions.*
2. All questions carry equal marks.

1. (a) Explain what is sag and why it is inevitable in overhead transmission line. What are the factors influencing it? (5 Marks)

   b) With usual notations derive an expression for maximum sag of a transmission line where the supports are at different levels. (5 Marks)

   c) An overhead transmission line with standard copper conductors supported on two poles 300 meters apart is, having a difference in level of 10 meters. The conductor diameter is 2.0cms and weighs 2.3kg/mt. Calculate the sag under lower support if factor of safety is 3. The maximum tensile strength of copper is 4200 kg/cm^2. (10 Marks)

2. (a) Derive an equation for inductance of a 3 phase unsymmetrically spaced but transposed transmission line/km. (8 Marks)

   b) The three conductors of a 3ϕ transmission line are arranged at the vertices of a triangle of sides 2.5m, 3m and 5m. Calculate the inductance per km of the line if the conductors are regularly transposed. The diameter of each line conductor is 1.5cms. (12 Marks)

3. (a) Derive an expression for capacitance of a 3 phase single circuit line with equilateral spacing. (10 Marks)

   b) A 3 phase single circuit 50 Hz line consists of 3 conductors each of diameter 21mm. The spacing between conductors is as follows.

   A - B = 2.5m, B-C = 4.5m, C-A = 3.5m.

   Find the capacitance and capacitive reactance/phase/km of the line. The line is transposed at regular intervals. (10 Marks)

4. (a) Derive an expression for ABCD constants of a medium transmission lines using nominal T method. Show that AD-BC =1. (10 Marks)

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b) A 3 phase transmission line is 400 km long and caters a load of 450 MVA, 0.8 p.f. lag at 345 kV. The ABCD constants are
A=D = $0.8181 \angle 1.3^0$ $B = 172.2 \angle 84.2^0$ $C = 1.933 \times 10^{-3} \angle 90.4^0$ mho. Sending end current and percentage voltage drop at full load. Also calculate receiving end line to neutral voltage at no load.

Calcualte the sending endline to neutral voltage. (10 Marks)

5. (a) Explain what is meant by string efficiency of an insulator string and how to improve it. (10 Marks)

b) A 3 phase overhead line is supported by three suspension type insulators. The potentials across the first and second insulator arc 7.5 kV and 10kV respectively. Calculate :

i) line voltage

ii) ratio of self capacitance to shunt capacitance

iii) String efficiency (10 Marks)

6. (a) Derive an expression for insulation resistance of a cable. (5 Marks)

b) Explain capacitance grading of cables with appropriate derivation. (10 Marks)

c) Calculate the capacitance & charging current of a single core cable used in 3 phase 66kV system. The cable is 1.5km long and having a core dia of 15cms and impregnated pager insulation of thickness 22.5cm. The relatives permittivity of the insulation may be assumed as 4 and supply frequency at 50Hz. (5 Marks)

7. (a) What is meant by D.C. distribution. Explain with diagram different types of D.C distribution and discuss their merits and demerits. (10 Marks)

b) A two wire D.C. distribution system is 4km long and it supples load of 250A, 175A, 100A, and 75A at 1200m, 1500m, 3500m, and 4000m from the feeding end A. Each conductor has go and return resistance of 0.0032Ω per 100mts. Calculate the voltage at each load point if the voltage at the feeding end is 250V.

(10 Marks)

8. Write short notes on any FOUR of the following :

a) Classification of transmission lines

b) Stringing chart

c) Ferranti effect

d) Disruptive critical voltage

e) Testing of insulators (5×4=20 Marks)

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