2002 SCHEME

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EE53

Fifth Semester B.E. Degree Examination, Dec.09-Jan.10
Electrical Power Transmission and Distribution

Time: 3 hrs. Max. Marks:100

Note: ***1. Answer any FIVE full questions.***
2. Assume any missing data.

1 a. Draw single line diagram of typical A.C. power supply scheme and explain. **(05 Marks)**
b. Explain clearely the advantages of High voltage transmission. **(05 Marks)**
c. Write a note on feeders, distributors and service-mains. **(10 Marks)**

2 a. Define Sag? Write the points to be noted for the calculation of sag. **(05 Marks)**
b. Calculate the sag when the supports are at unequal level. **(05 Marks)**
c. Two towers of height 40m and 30m respectively support a transmission line conductor at water crossing. The horizontal distance between the towers is 300m. If the tension in the conductor is 1590 kg, find the minimum clearance of the conductor and water and clearance mid-way between the supports. Weight of conductor is 0.8 kg/m Bases of the towers are at water level. **(10 Marks)**

3 a. Calculate the inductance of a single phase two – wire line. (loop inductance). **(06 Marks)**
b. Calculate the inductance of a 3-phase overhead line for symmetrical spacing. **(08 Marks)**
c. A single phase transmission line has two parallel conductors 3m apart, the radius of each conductor being 1cm. Calculate the loop inductance per km length of the line if the material of the conductor is i) Copper; ii) Steel with relative permeability of 100. **(06 Marks)**

4 a Write how the transmission lines are classified. **(04 Marks)**
b. Explain clearely the nominal T-method to calculate sending end voltage, regulation and efficiency for medium transmission lines. **(08 Marks)**
c. A 3-phase, 50Hz transmission line 100 km long delivers 20 MW at 0.9 p.f. lag and at 110KV. The resistance and reactance of the line per phase per km are 0.2Ω and 0.4Ω respectively, while capacitance admittance is 2.5×10^{-6} Siemen/km/phase. Calculate i) The current and voltage at the sending end; ii) Efficiency of transmission, use nominal T-method. **(08 Marks)**

5 a. Define string efficiency. Derive the mathematical expression for string efficiency. **(08 Marks)**
b. What are the methods of improving string efficiency? **(04 Marks)**
c. In a 33KV 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. Derive the expression for insulation resistance of single core cable. **(06 Marks)**
b. Prove that $\frac{g_{max}}{g_{min}} = \frac{D}{d}$ for single core cable. **(06 Marks)**
c. A single core cable for use on 11 KV, 50Hz system has conductor area of 0.645 cm^2 and internal diameter of sheath is 2.18 cm. The permittivity of the dielectric used in the cable is 3.5. Find :
i) The maximum electrostatic stress in the cable
ii) Minimum electrostatic stress in the cable
iii) Capacitance of the cable per km length
iv) Charging current. **(08 Marks)**

7 a. How distributors are classified? Explain. **(05 Marks)**

b. Derive the expression for the total voltage drop in a uniformly distributed cable fed at one end. **(05 Marks)**

c. ABCDEA a ring distributor with inter connector BD fed at point A. The resistances of the different sections of distributor are AB = 0.075Ω, BC = 0.025Ω, CD = 0.01Ω, DE = 0.05Ω, EA = 0.1 Ω Loads are, at B = 10 Amp, at C = 30A, D = 20A, E = 10A respectively. Calculate : i) Current in the interconnector; ii) Voltage drop in the interconnector. **(10 Marks)**

8 Write short notes on (any 4)

a. Phenomenon of carona

b. Grading of cables

c. ABCD constants of medium transmission line (π – method)

d. Testing of insulators

e. Factors affecting disruptive and critical voltage. **(20 Marks)**

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