NEW SCHEME

EE53

USN | | | | | | | | | | |

Fifth Semester B.E. Degree Examination, January/February 2005
Electrical & Electronics Engineering

Electrical Power Transmission & Distribution

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

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

1. (a) Draw the line diagram of a typical power-scheme indicating the standard voltages. **(5 Marks)**
   (b) Show that a transmission line conductor suspended between level supports assumes the shape of a catenary. Derive the expression for sag. **(8 Marks)**
   (c) An overhead transmission line at a river crossing is supported from two towers at heights of 25m and 75m. If the required clearance between conductor and water midway between the towers is 45m and if both the towers are on the same side of the point of maximum sag of the parabolic configuration, find the stringing tension in the conductor.
   Weight of conductor = 0.7 kg/m
   Distance between towers = 250 m **(7 Marks)**

2. (a) Explain the terms self GMD and mutual GMD. Prove that the inductance of a group of parallel wires carrying current can be represented in terms of their geometric distances. **(10 Marks)**
   (b) The three conductors of a 3 phase line are arranged as shown. Calculate the capacitance of each conductor. Radius of conductor = 1 cm **(10 Marks)**

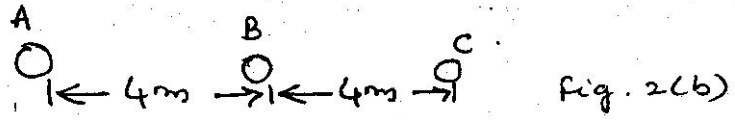


fig. 2(b)

3. (a) Derive expressions for the generalised A,B,C,D constants of a long transmission line by Rigorous method of analysis. **(10 Marks)**
   (b) A 3 phase transmission line has the following constants (line to neutral).
   Resistance = 10Ω. Inductive reactance = 20Ω
   Capacitive susceptance = 4×10^{-4} mho.
   Using nominal T method, calculate the sending end voltage, line current, power factor, efficiency and regulation when supplying a balanced load of 10 MW at 66 kV, 0.8 power factor lagging. **(10 Marks)**

4. (a) Define string efficiency. How the string efficiency is improved? Explain any two methods. **(6 Marks)**
   (b) Explain the various tests conducted on insulators. **(7 Marks)**
   (c) Each of the three insulators of a string has self capacitance C Farad. Capacitance of connecting metal work to earth is 0.2 C and 0.1 C to line. Calculate the voltage across each insulator as a percentage of line voltage to earth. Also find string efficiency. (The string has three insulators). **(7 Marks)**

5. (a) Draw the cross sectional view of a single core cable and explain the construction. **(5 Marks)**
   (b) Compare the dielectric stress of a homogeneous cable with that of a capacitance graded cable. **(7 Marks)**
   (c) A single core cable is graded by using three dielectrics of relative permittivity 5,4 and 3 respectively. The conductor diameter is 2cm and overall diameter is 8cm. If the three dielectrics are worked at the same maximum stress of 40 kN/cm, find the safe working voltage of the cable. **(8 Marks)**

6. (a) What is corona? Derive expressions for the disruptive critical voltage and visual critical voltage. **(8 Marks)**

   (b) What are the effects of corona? **(3 Marks)**

   (c) Find the corona characteristics of a 110 kV, 50 Hz, 3 phase transmission line 175 km long consisting of three 1 cm dia stranded conductors arranged in the form of a delta with a spacing of 3m. The barometric pressure is 74cm of mercury and temperature 26^0C. Surface factor is 0.85. For local corona surface factor is 0.72 and 0.82 for general corona. **(9 Marks)**

7. (a) A ring main D.C distributor is as shown

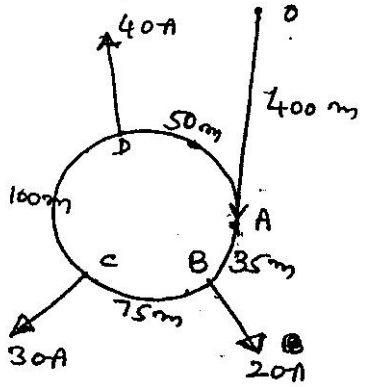
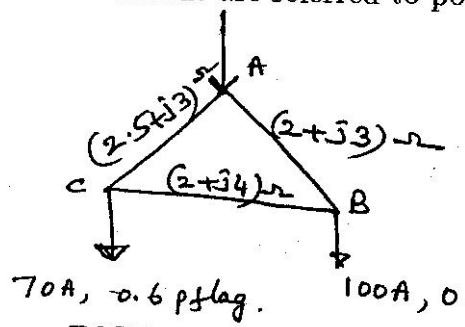


Fig. 7(a)

Feeder cross section of OA is a_f and the cross section of distributor ABCD A is a_d. If it is desired that the minimum potential in the ring at any load point shall not be less than 230 V and the copper in the conductors is minimum, find the ratio of a_f to a_d.

Take specific resistance of copper = 1.73 $\mu\Omega - cm$. Voltage of feeding point A is 240V. **(10 Marks)**

(b) A 3 phase 66 kV station supplies loads as shown. Calculate the current in each section. Power factor of loads are referred to point A. **(10 Marks)**



8. Write short notes on any FOUR : **(5×4=20 Marks)**

   i) Advantages of high voltage transmission
   ii) Testing of cables
   iii) Stringing chart and its application
   iv) Radial and ring main distributors
   v) Transposition of transmission lines.

** * **