[06 – 3219]

III/IV B.E. DEGREE EXAMINATION.

Second Semester

Electrical and Electronics Engineering

TRANSMISSION AND DISTRIBUTION

(Common with Dual Degree in EEE)

(Effective from the admitted batch of 2006–2007)

Time : Three hours Maximum : 70 marks

Question No. 1 is compulsory.

Answer any FOUR from the remaining.

All questions carry equal marks.

1. (a) (i) Name the various types of D.C. links.

(ii) What is the necessity of EHVAC transmission?

(b) What is the effect of system voltage on transmission efficiency?

(c) What are the advantages of ring mains over a radial system of distribution?

(d) Explain the concept of GMD and GMR.

(e) What are the advantages bundled conductors?

(f) Write the expression for the sag when the line is supported at unequal heights.

(g) Define critical disruptive voltage and visual disruptive voltage.

2. (a) Compare the weights of copper required in a single-phase AC. system with that of a 3-phase, 3-wire system in a transmission scheme for the same power transmitted and the maximum voltage between the conductors. Assume same percentage loss and balanced load with u.p.f.

(b) The daily load cycle of a 3-phase, 110 kV line is given below :

24 MW for 6 hours, 8 MW for 6 hours and 4 MW for the remaining day. The power factor of the load is 0.8 leading. Determine the most economical cross-section, if the cost of the line including erection is Rs. (12000 + 8000 a)

3.

per km, where 'a' is the area of cross-section of each conductor in cm^2. The line is used throughout the year. The resistance of each conductor is $\frac{0.19}{a}$ ohm and energy costs 10 paise per unit.

3. (a) Define the term "Regulation" of a short line. Derive an expression for the regulation in terms of the line parameters, load current and power factor of the load.

(b) A transmission line has the following parameters

Length of the line = 80 km; Resistance per km = 0.01 Ω;

Reactance per km = 0.02 Ω and the power delivered at the receiving end = 100 MW at 66 kV, 3-phase, 0.8 pf. lagging.

Calculate the regulation and efficienty of transmission.

4. (a) Derive an expression for the capacitance of a 3-phase line with equilateral spacing.

(b) A 3-phase, 3 wire system has its conductors arranged at the corners of an equilateral triangle of 2 m side. The diameter of each conductor is 2.5 cm. Calculate the inductance and capacitance of each conductor per km length.

5. (a) Develop an expression for the sag of transmission line conductor, suspended between two supports of different levels assuming the curve taken up by the conductor to be a parabola.

(b) An over load conductor having an ultimate strength of 8000 kg/cm^2 and an area of 2 cm^2 is erected between supports placed 650 meters and having a level difference of 10 meters. If the maximum ground clearance is to be 50 m, find the tower heights. The conductor is subjected to a horizontal wind pressure of 1.75 kg/m. The self weight of the conductor is 2 kg/m. Assume a factor of safety of 4.

6. (a) Describe the methods of equalising the potential distribution across a string of suspension insulators.

(b) A single-core lead sheathed cable is designed for 100 kV to earth. Its conductor radius is 5 mm and three insulating materials have relative permittivities of 4.5, 3 and 2.5 with maximum permissible stress of 50, 40 and 30 kV/cm respectively. Determine the internal diameter of the lead sheath.

7. (a) What is receiving end power circle diagram? Explain how it is constructed for a transmission line whose A,B,C and D constants are given.

(b) A ring main can be considered to be a quadrilateral whose parameter is 300 m. The system is fed at a point A at 240 volts. Loads are taken off the points B, C and D and are 100 A, 70 A and 50 A respectively. If AB = 70 m, DC = 90 m and CB = 80 m and the resistance of each conductor is 0.2 Ω/km, find the voltages at B and C.

8. (a) Briefly discuss the effect of corona communication lines.

(b) Determine the critical disruptive voltage and corona loss for a 3-phase line operating at 110 kV which has a conductor of 1.25 cm diameter arranged at the vertices of an equilateral triangle of side 3.05 cm. Assume air density factor of 1.07 and dielectric strength of air at NTP is 21 kV/cm.
