

Second Part

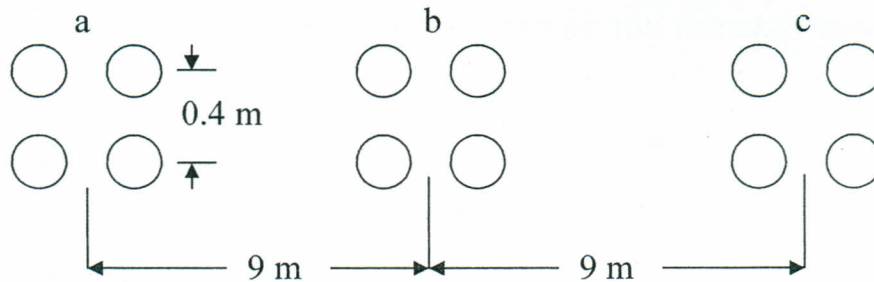
■ **Please Answer ALL Questions**

First Question

(22 marks)

A 50 Hz bundled three-phase transposed overhead transmission line has the conductors' arrangement shown in figure. The bundle spacing is 40cm. The line has a length of 290 km and a resistance of 0.12Ω per km. The conductor diameter is 2.4 cm. The line circuit is delivering 250 MW at 500 kV and at 0.86 lagging power factor. **Determine:**

(i) the percentage voltage regulation. (ii) the transmission efficiency.



Second Question

(15 marks)

A two wire radial dc distributor ABCDEFG is fed at A and E at equal potential of 250 V. The distributor is loaded with concentrated loads of 230 A at point B, 150 A at point C, 170 A at point D, 130 A at point F and 180 A at point G. Point B is 50 m from A. Point C is 150 m from B. Point D is 100 m from C. Point E is 150 m from D. Point F is 100 m from E. Point G is 150 m from F. In addition to the concentrated loads, a uniformly distributed load of density 0.6 A/m is fed in the section BC and in the section DE. The resistivity of the conductor material is $1.7 \times 10^{-8} \Omega \cdot m$. **Calculate:**

(i) the cross section area of the conductor such that the maximum voltage drop does not exceed 10 V. (ii) the power loss in the whole distributor.

Third Question

(18 marks)

(a) A 50Hz, 3-phase ring main BCDEB is fed through a feeder AB from a 11 kV source located at A. The ring supplies balanced loads of 58A at 0.84 lagging power factor at C, 64A at 0.72 lagging power factor at D and 47A at 0.86 lagging power factor at E. The load currents are referred to the voltage at point A. The impedances per phase of the various ring sections are:

Section BC = $2 + j1 \Omega$, Section CD = $3 + j2 \Omega$, Section DE = $1.5 + j2 \Omega$, and Section EB = $2 + j3 \Omega$. The per phase impedance of the feeder AB is $2 + j2.5 \Omega$.

Compute:

(i) the voltages at C and D. (ii) the total power delivered by the supply.

(b) Draw the single-line diagram of the 66/11 kV substation giving the components names.

Good luck