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Question 2

Given data:-

Supply load is 150A, 200A, 250A, 100A distance of 500m, 1300m 2300, 300m.

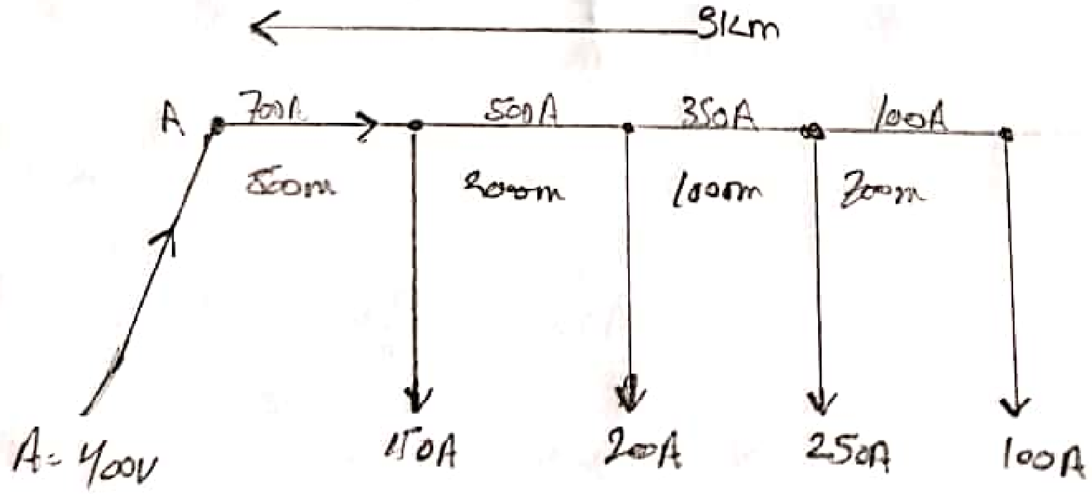
The Resistance of each Conductor is R = 0.02 Per 1000m

Potential difference of Point A = 400V

Required Data :-

Potential difference of each load = ?

Solution:-



The Single line diagram of the distributer with its tapped Current

Resistance Per 1000m distributer is

$= 2 \times 0.02 = 0.04\Omega$

Resistance of Section AC, RAC

AC, $R_{AC} = 0.04 \times 0.500/1000 = 0.04 \times 0.5$

AC, $R_{AC} = 0.02\Omega$

Resistance of Section CD, RCD

CD, $R_{CD} = 0.04 \times \frac{800}{1000} = 0.04 \times 0.8$

CD, $R_{CD} = 0.032\Omega$

Resistance of Section DE, RDE

DE, $R_{DE} = 0.04 \times \frac{1000}{1000} = 0.04 \times 1$

DE, $R_{DE} = 0.04\Omega$

Resistance of Section

EB, $R_{EB} = 0.04 \times 700/1000$

$= 0.04 \times 0.7$

EB. $R_{EB} = 0.028\Omega$

The amount in the various Section of distributor are

$I_{EB} = 100A$, $I_{DE} = 100 + 250$
$= 350 A$

$I_{CD} = 350 + 200 = 550A$

$I_{AC} = 550 + 150 = 700A$

★ Potential difference at Point C ?

V_C = Voltage at A - Voltage drop in A.C

$= V_A - I_{AC} \cdot R_{AC}$

$= 400 - 700 \times 0.02$

$= 400 - 14$

$VC = 386V$

Potential difference at Point D = ?

$V_D = V_C - I_{CD} \cdot R_{CD}$

$= 386 - 550 \times 0.032$

$= 386 - 17.6$

$= 368.4V$

$V_D = 368.4V$

Potential different at Point O = ?

$V_E = V_D - I_{DE} \cdot R_{DE}$

$= 368.4 - 350 \times 0.04$

$= 368.4 - 14$

$= 354.4V$

$V_E = 354.4V$

Potential difference at load Point B

$V_B = V_E - I_{EB} \cdot R_{EB}$

$= 354.4 - 100 \times 0.028$

$= 354.4 - 2.8$

$V_B = 351.6V$

Answer 1

Solution:.

Resistance of 1m length distributer

$= 2 \times \frac{1.5\times10^{-5} \times 100}{1} = 3\times10^{-3}$

Resistance of Section = AC, $R_{ac} = (3\times10^{-3})100 = 0.3\Omega$

Resistance of Section = CD, $R_{cd} = (3\times10^{-3})150 = 0.4\Omega$

Resistance of Section = DE, $R_{de} = (3\times10^{-3})100 = 0.3\Omega$

Resistance of Section EF, $R_{ef} = (3\times10^{-3})100 = 0.3\Omega$

Resistance of Section = FB, $R_{fb} = (3\times10^{-3})100 = 0.3\Omega$

Voltage at Y = Voltage at X - drop over length XY

$$V_Y = [V_X - I_A R_{AC} + (I_A - 20)R_{CD} + (I_A - 60)R_{DE} + (I_A - 110)R_{EF} + (I_A - 140)R_{FB}]$$

$$230 = 230 - [0.3I_A + 0.4(I_A - 20) + 0.3(I_A - 60) + 0.3(I_A - 110) + 0.3(I_A - 140)]$$

$$= 230 - (1.6I_A - 12.58)$$

or $1.6I_A = 12.58$

$I_A = 12.58/-1.6 = 7.862A$

knowing te value of

I_A Current in any Section Can be determined. thus Current in Section Cd, $I_{CD} = I_A - 20 = 7.862 - 20$

$= -12.138A$ from C to D

$I_{DE} = I_A - 60 = 7.682 - 60 = -52.138A$ from D to E

Current in Section EF. $I_{EF} = I_A - 110 = 7.862 - 110$

$= -102.138A$ from E to F

Current in Section FB. $I_{FB} = I_A - 140 = 7.862 - 140$

$= -132.138A$ from F to B

The actual distribution of Current in the various Section of the distributors

it is clear that Current are Coming to the load Point E from both Sides i.e from D

∴ Minimum Consumer Voltage

V_E $V_A - (I_{AC}R_{AC} + I_{CD}R_{cd} + I_{DE}$ R_{DE}

Scanned with CamScanner

$= 230 - (7.682 \times 0.3 + 7.862 \times 0.4 + 7.868 \times 0.3)$

$= 230 - 7.682$

$= -222.318V$

Answer 3

Solution

Current on +ve outer $I_1 = 260/7 = 37.14A$

Current on -ive outer $I_2 = 260/9 = 28.88A$

Current in neutral $= I_1 - I_2 = 37.14 - 28.88 = 8.26A$

Voltage between +ve outer and neutral at feeding end is

$V_1 = V_{EL} + I_1 R_{AE} + (I_1 - I_2) R_{NL}$

$= 260 + 37.14 \times 0.2 + 8.26 \times 0.2 = 269.08V$

Voltage between -ive outer and neutral at feeding end is

Scanned with CamScanner

$V_2 = V_{LC} - (I_1 - I_2) R_{NL} + I_2 R_{BC}$

$= 260 - 8.26 \times 0.2 + 28.88 \times 0.2 = 267.42V$

Answer 4

(A) (i) High Insulation resistance to avoid leakage Current.

(II) High mechanical Strength to withstand the mechanical handling of underground Cables

(III) High diedectric Strength to avoid electrical breakdown of the cable

(IV) Non-hygroscopic i.e it should not absorb moisture from air or Soil. The moisture tends to decrease the Insulation resistance and hastens the breakdown of the cable. In case the Insulting material is hygroscopic it must be enclosed in a waterproof covering like lead sheath

(V) Non-inflammable.

Types of underground Cables

(VI) low Cost So as to make the underground System a viable Proposition

(VII) Unaffected by acids and alkalies to avoid any chemical action. The Principal insulating materials used in Cables are rubber. vulcanised India rubber impregnated Paper varnished Cambric and Polyvinyl chloride.

(B) Rubber may be obtained from the milky Sap of tropical trees or it may be Produced from oil Products. it has relative Permittivity varying between 2 and 3 dielectric Strength is about 30kV/mm and resistivity of insulation is $10^{17}\ \Omega$ cm. Although Pure rubber has reasonably high Insulating Properties it Suffers from Some major drawbacks viz readily absorbs moisture the maximum Safe temperature is low (about 38°C) Soft and liable to damage due to rough handling and ages when exposed to light. Therefore Pure rubber Cannot be used as an Isulating material.

Answer No 5

(A)

- A trench of about 1.5 meters deep and 45cm wide is dug.
- Then the trench is Covered with a 10 cm thick layer of fine Sand.
- The cable is laid over the Sand bed. The Sand bed Protects the cable from the moisture from the ground.
- Then the laid cable is again Covered with a layer of Sand of about 10cm thick.
- When multiple cables are to be laid in the Same trench a horizontal or verticle Spacing of about 30cm is Provided to reduce the effect of mutual heating Spacing between the cables also ensures a fault accurring on one Cable. does not damage the adjacent Cable.
- This method is the most Popular as it is Simple and cheap The Cables to be laid using this method must have the Serving of bituminised Paper and hessian tape So as to Provide Protection against Corrosion and electrolysis. The direct laying Procedure is as follows.

(B)

The Solid System of Cable laying is mainly Performed where the cable is laid in the wood Cast Iron, or another nonsoil Surface Normally Cable is laid in the manner which Provides good mechanical Strength to Cables

This System is much appropriate for Solid based System Normally the Cables are filled with bituminous materials for Providing Protection and avoid heat dissipation. Then another Asphalt Cover layer around the Cable and bituminous material ased for further Protection.

The System is expensive Compare to the direct laid System and heat dissipation Capacity is not much good Compere with other Systems But for toughing material woods are much Cheap so it is widely used by Considering the economical Impacts.