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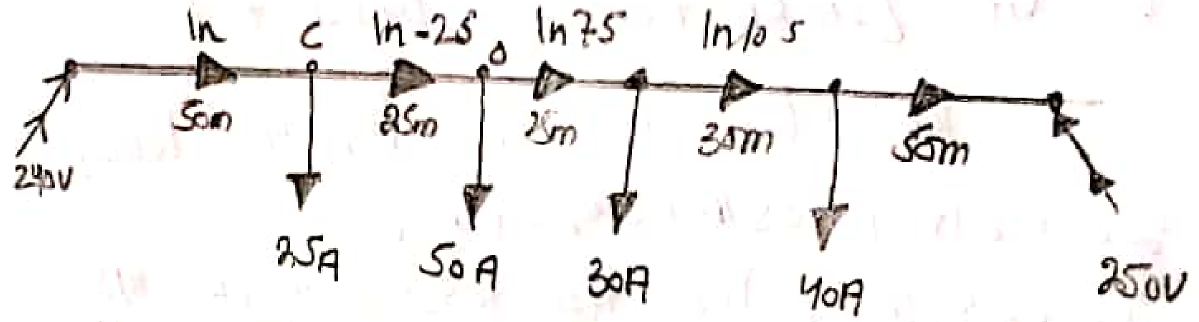
Q1:- A 2 wire D.C Distributor AD is feed from both ends. At feeding Point A. the Voltage is maintained as at A. ~~the voltage is maintained as~~ A 240v at B 250v. The total length of the distributor is 300 meter and loads are tapped off as under.

25A at 50 meters from A;
50A at 75 meter from A;
30A at 100 meter from A;
40 A at 150 meters from A;

The resistance per kilometer of one Conductor is 0.5Ω. Calculate
i) Current in various Section of the distribution
II) Minimum voltage and the Point at which it occurs?

Solution :-



The above figure Shown the Distributior with its tapped Current let IA Cumperes be the current supplied from the feeding Point of A. Then Currents the various Sections of the distributers are as Shown

Resistance of 1000 m length of distributor both wires = 2×0.5 = 1

Resistance of Section AC, RAC =
= 1×50/1000 = 0.05 Ω

Resistance of Section CD, RCD = 1×2.5/1000 = 0.025 Ω

Resistance of Section DE, RDE = 1×25/1000 = 0.025 Ω

Resistance of Section EF, REF = 1×50/1000 = 0.05 Ω

Resistance of Section FB, REB = 1×50/1000 = 0.05 Ω

Voltage at B = Voltage at A
Drop over A, B

$V_B = V_A - [I_A R_{AC} + (I_A - 25) R_{CD} + (I_A - 75) R_{DE} + (I_A - 105) R_{EF} + (I_A - 145) R_{EB}]$

$250 = 240 - [0.05 I_A + 0.025 (I_A - 25)$
or $+ 0.025 (I_A - 75) + 0.05 (I_A - 105) + 0.05 (I_A - 145)$

or $250 = 240 - [0.2 I_A - 9]$

or $I_A = \frac{249 - 250}{0.2} = 5A$

(i) ∵ Current in Section AC. $I_{AC} = I_A = 5A$

Current in Section CD. $I_{CD} =$

$= -25 = 5 - 25 = 20A$

Current in Section DE. $I_{DE} = I_A - 75$

$= 5 = 75 = 70A$

From D to E and form E to D

Current in Section EF. $I_{EF} = I_A - 105 =$

$= 5 - 105 = 100A$ from E to F and 100A from F to E

Current in Section FB. $I_{FB} = I_A - 145$

$= 5 - 145 = 140A$ from F to B and 140A and B to F

(II) The actual distribution of Currents in the various Section of the distribution is the Currents are Coming to load Point D from Both Sides of the distributor therefore load Point D is the Point of minimum Potential.

Voltage at D, $V_D = V_A - [I_{AC} R_{AC} + I_{CD} R_{CD}]$

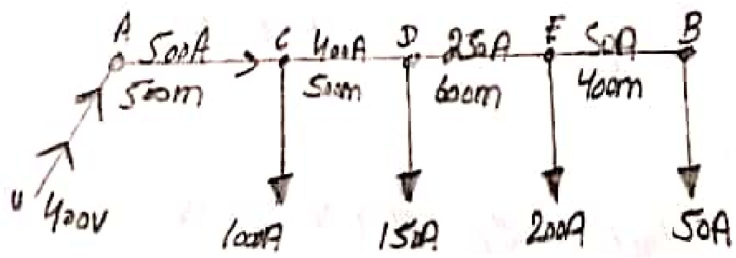
$= 240 - [5 \times 0.05 + 20 \times 0.025]$

$= 240 - 0.75$

$= 239.25V$ Ans

Question # 2 :- A 2-wire DC distributor cable AB is 1km long and supplies loads of 100A, 150A, 200A and 50A situated 500m, 1000m, 1500m and 1000m from the feeding point A. Each conductor has a resistance of 0.02 Ω per 1000m. Calculate the P.d at each load point if a P.d of 400V is maintained at point A.

Solution:-



Resistance per 1000m of distributor

$= 2 \times 0.02 = 0.04 \Omega$

Resistance of Section AC, $R_{AC} = 0.04 \times 500/1000$

$= 0.02 \Omega$

Resistance of Section CD, $R_{CD} = 0.04 \times 500/1000$

$= 0.02 \Omega$

Resistance of Section DE, RDE =
$= 0.04 \times 600/1000 = 0.024\Omega$

Resistance of Section EB, REB = $0.01 \times 900/1000$
$= 0.016\Omega$

The Current in the various Selection of the distributors are?

$I_{EB} = 50A$; $I_{DE} = 50 + 200 = 250A$

$I_{CD} = 250 + 150 = 400A$

$I_{AC} = 400 + 100 = 500A$

PD at load Point C V_C = voltage at

A - voltage drop in AC

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

$= 400 - 500 \times 0.02$

$= 390V$

P.D at load Point D. $V_D = V_C - I_{CD} R_{CD}$ =

$= 390 - 400 \times 0.02$

$= 382V$

P.D at load Point E.

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

$= 382 - 250 \times 0.024$

$= 376V$

P.D at load Point B.

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

$= 376 - 50 \times 0.016$

$= 375.2V$ Ans