Department of Electrical Engineering
Sessional Assignment
Course Details

Course Title: Electric Power Distribution & Utilization **Module:** 3rd (BTech)

Student Details

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Q1: A 2-wire D.C. distributor AB is fed from both ends. At feeding point A, the voltage is maintained as at A 240 V and at B 250 V. The total length of the distributor is 300 meters and loads are tapped off as under:

25 A at 50 meters from A; 50 A at 75 meters from A

30 A at 100 meters from A; 40 A at 150 meters from A

The resistance per kilometer of one conductor is 0·5 Ω. Calculate:

(i) Currents in various sections of the distributor

(ii) Minimum voltage and the point at which it occurs

Q2: A 2-wire D.C. distributor cable AB is 1 km long and supplies loads of 100A, 150A, 200A and 50A situated 500 m, 1000 m, 1500 m and 1000 m from the feeding point A. Each conductor has a resistance of 0·02Ω per 1000 m. Calculate the p.d. at each load point if a p.d. of 400 V is maintained at point A.

Power Distribution (9) ID # 15493

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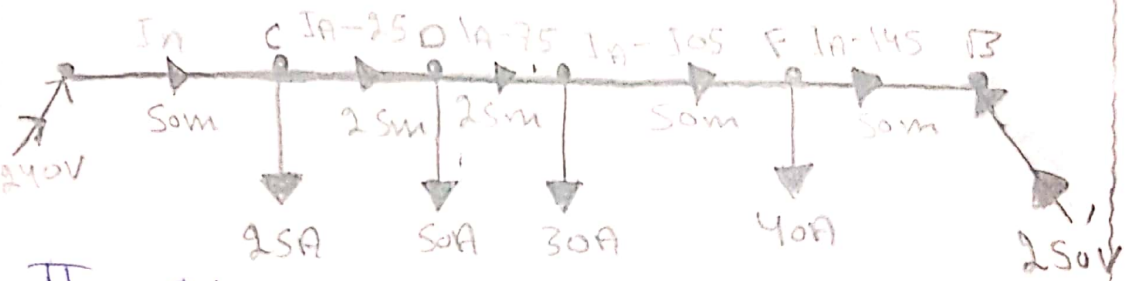
25A at 50 meters from A;
50A at 75 meters from A;
30A at 100 meters from A;
40A at 150 meters from A;

The resistance per kilometer of one conductor is 0.5 Ω. Calculate

(i) Current in various section of the distributor
(ii) Minimum voltage and the Point at which it occurs.

Solution:-



The above figure shown the Distribution with its tapped current let I_A amperes be the current supplied from the feeding Point A. Then Currents the various sections of the distributers are as shown.

Resistance of 1000m length of distributor (both wires)
$= 2 \times 0.5 = 1$

Resistance of section AC, R_{AC} =
$= 1 \times 50/1000 = 0.05\Omega$

Resistance of section CD, $R_{CD} = 1 \times 25/1000$
$= 0.025\Omega$

Resistance of section DE, $R_{DE} = 1 \times 25/1000$
$= 0.025\Omega$

Resistance of section EF, $R_{EF} = 1 \times 50/1000$
$= 0.05\Omega$

Resistance of section FB, $R_{FB} = 1 \times 50/1000$
$= 0.05\Omega$

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

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

$$250 = 240 - [0.05 I_A + 0.025 (I_A - 25)$$

or $+ 0.025 (I_A - 75) + 0.05 (I_A - 105)$

or $+ 0.05 (I_A - 145)$

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

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

(i) ∵ Current in section AC, I_{AC}

$= I_A = 5 A$

Current in section CD, I_{CD}

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

Current in section DE, $I_{DE} = I_A - 75$

$= 5 - 75 = 70 A$

70A from D to E and 70A from E to D

current in section EF, $I_{EF} = I_A - 105$

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

current in section FB, $I_{FB} = I_A - 145$

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

(ii). The actual distribution of currents in the the various section of the distributor is. The currents are coming to load Point D from both sides of the the distributor. therefore load Point D is the Point of minimum Potential.

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

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

$= 240 - 0.75$

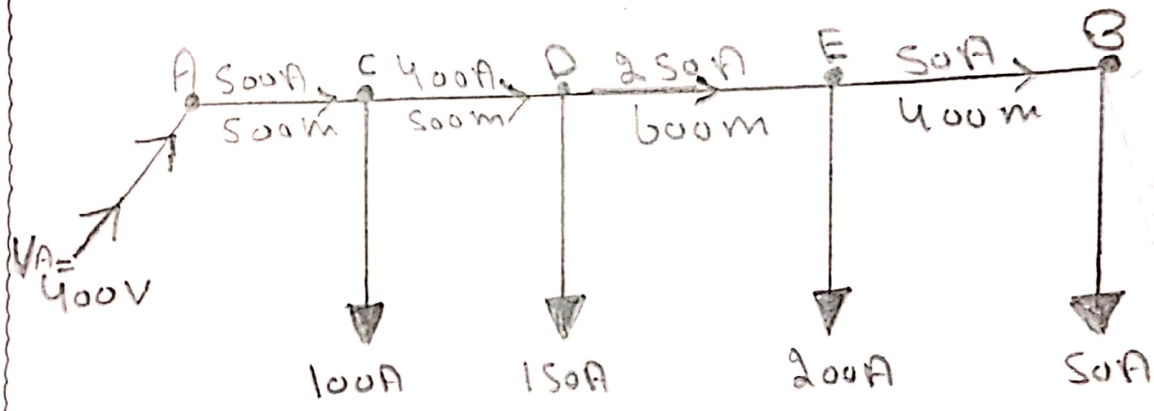
$= 239.25\ V$

Ans

(b) ID # 15493

Q2: A 2-wire DC. distributor cable AB is 1 Km 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 0.02Ω 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, R_{DE} =

$= 0.04 \times 600/1000 = 0.024\Omega$

Resistance of section EB, $R_{EB} = 0.04 \times 400/1000$

$= 0.016\Omega$

The current in the various sections of the distributors are:

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

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

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

P.D 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,

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

$$= 382 - 250 \times 0.024$$

$$= 376\,V$$

P.D at Load Point B.

$$V_{B\cdot} = V_E - I_{EB} R_{EB}$$

~~$388 - 50 \times 0.00$~~

$$= 376 - 50 \times 0.016$$

$$= 375.2\,V.$$

Any