ID # 15276

Q1:- A 2 wire DC distributor AB is feed from both ends At feeding Point A, the voltage is maintained as at A 240V and at B 250V the total length of the distributor is 300 meter and loads are tapped off as under.

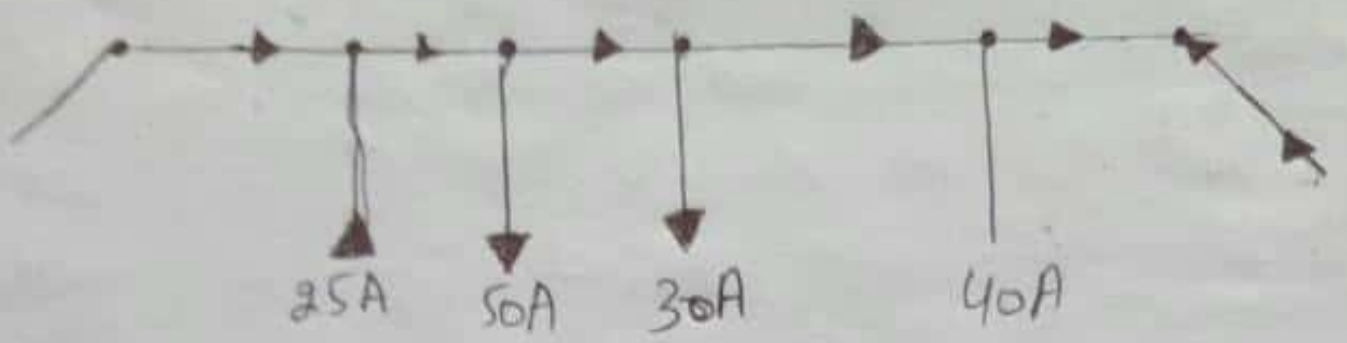
25A at 50 meters from A;
50A at 75 meters from A;
30A at 100 meters from A;
40A at 150 meters from A;

The resistence per Kilometer of one conductor is 0.5 Ω. calculate

i) corrent in various section of the destributor.

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

Solution :-



The above figure shown the distribution with its tapped current let IA amperes be the current supplied from the feeding point A then currents the various section of the distributers are as shown.

Resistance of 1000 m 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, $R_{CD} = 1 \times 95/1000$
$= 0.095\ \Omega$

Resistance of section DE, $R_{DE} = 1 \times 95/1000$
$= 0.095\ \Omega$

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

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

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

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

$250 = 240 - [0.05\ IA + 0.025(IA - 95)$
$+ 0.025(IA - 75) + 0.05(IA - 105)$
$+ 0.05(IA - 145)$
$250 = 240 - [0.2\ IA - 9$
$IA = \frac{249 - 250}{0.2} = 5A$

i, current in section AC . IAC
$= IA = 5A$
current in section CD . ICD
$= -95 = 5 - 95 = 90A$
current in section DE, $IDE = IA - 75$
$= 5 - 75 = 70A$
from D to E and
fert from E to D
current in section EF, $IEf = IA - 105$
$= 5 - 105 = 100A$ from E to f and
100A from f to E.
current in section fB . $IfB = IA - 145$
$= 5 - 145 = 140A$ from f to B and
140A and B + o f

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, $V_D = V_A - [I_A \cdot R_{AC} + I_{CO}]$

$= 250 - [5 \times 0.05 + 20 \times 0.095]$

$= 250 - 0.75$

$= 239.25V$ Ans:-

Resistance per 1000m of distributor
$= 2 \times 0.02 = 0.04\ \Omega$

Resistace of section AC. RAC =
$0.04 \times 500 / 1000 = 0.02\ \Omega$

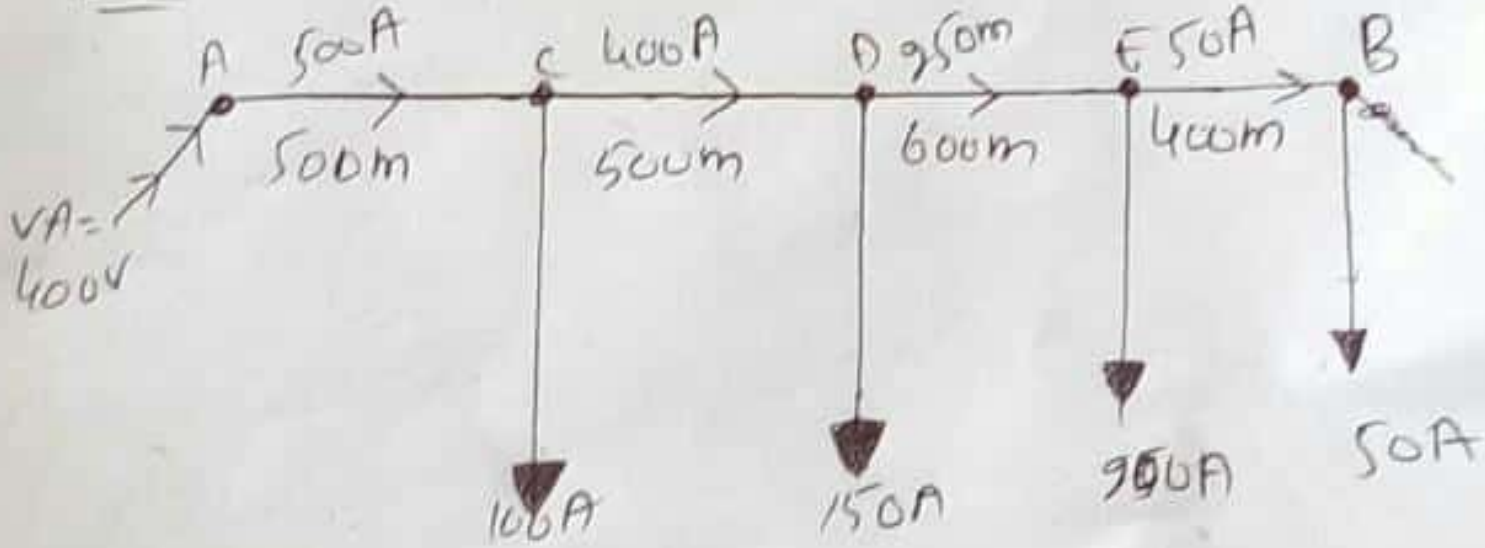
Resistance of section CD. RCD =
$= 0.04 \times 500 / 1000 = 0.02\ \Omega$

Resistance of section DE, RDE =
$= 0.04 \times 600/1000 = 0.024\ \Omega$
Resistance of section FB, REB = $0.04 \times 400/1000$
$= 0.016\ \Omega$
the current in the various section of the distributors are:-

$I_{FB} = 50A$; $I_{DE} = 50 + 200 = 250A$
$I_{CD} = 250 + 150 = 400A$
$I_{AC} = 400 + 100 = 500A$
P.D at load point C, VC = 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. $V_D = V_C - I_{CD} R_{CD}$
$= 390 - 400 \times 0.02$
$= 382V$

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 p.d of 400V is maintance at point A.

Solution



P.D at load point E,

$V_E = V_0 - I_{DE} R_{DE}$

$= 382 - 950 \times 0.094$

$= 376\ V$

P.d at load point B.

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

$= 376 - 50 \times 0.016$

$= 375.9\ V.$

Ans:-