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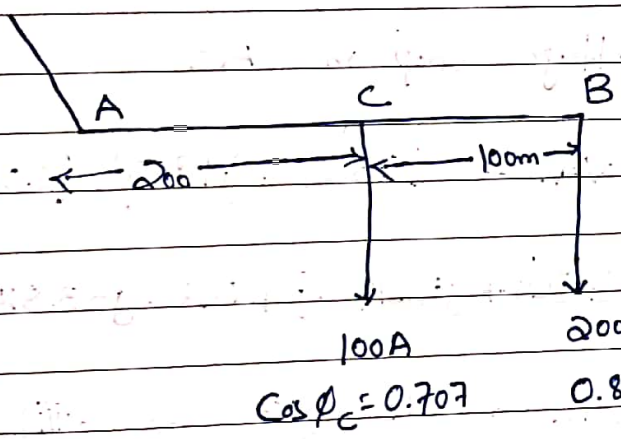
Q#03 A Single phase AC distributor AB 300M long is fed from end A and is loaded as under.

i) 100 A at 0.707 PF lagging 200m from point A

ii) 200 A at 0.8 pf lagging 300m from point A, The load resistance and reactance of the distributor. The load Power factor refer to the voltage at the far end?

Ans:-

The given conditions are drawn as



Let C is the point 200 m away from the point A.

First of all Current in AC

$$I_{AC} = 100(\cos\phi_C - j\sin\phi_C) + 200(\cos\phi_B - j\sin\phi_B).$$

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$= 100(0.707 - j0.707) + 200(0.8 - j0.6)$

$= 70.7 - j70.7 + 160 - j120$

$I_{AC} = 230.7 - j190.7$ ——— (i)

Now impedance in AC (200) = 0.2 km

$Z_{AC} = (R + jx) = (0.2 \times 0.2 + j0.1 \times 0.2)$

$Z_{AC} = 0.04 + j0.02$ ——— (ii)

Now voltage drop in AC

$V_{AC} = (230.7 - j190.7)(0.04 + j0.02)$

$V_{AC} = 9.228 + j4.614 - j7.628 - j23.814 =$

$V_{AC} = 13 - j3$ ——— (iii)

Now current in CB section CB = I_{CB}

$I_{CB} = 200(0.8 - j0.6) = 160 - j120$ ——— (iv)

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Impendance = $Z_{CB} = 0.2 \times 0.3 + j\,0.1 \times 0.3$

$Z_{CB} = 0.06 + j\,0.03$ ——— (v)

Voltage drop $V_{CB} = (160 - j120)(0.06 + j0.03)$

$V_{CB} = 9.6 + j\,4.8 - j7.2 - j\,23.6$

$V_{CB} = 13.2 - j\,2.4$ ——— (vi)

Total voltage drop

$(13 - j3) + (13.2 - j2.4)$

$V_{drop} = 26.2 - j5.4$

and its magnitude = $\sqrt{(26.2)^2 + (5.4)^2}$

$V_{drop} = 26.75$ volts.