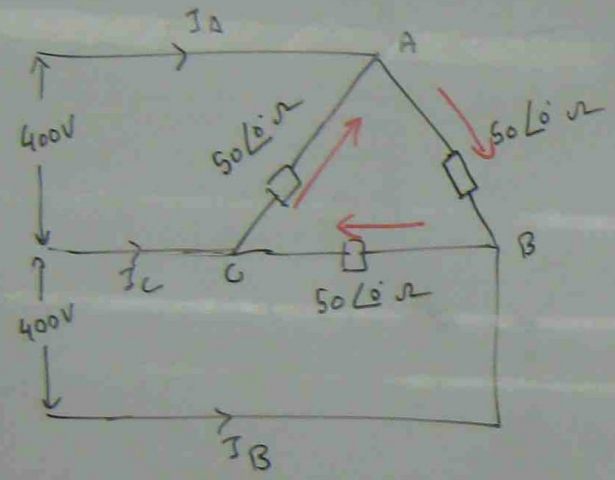
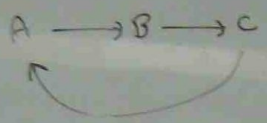
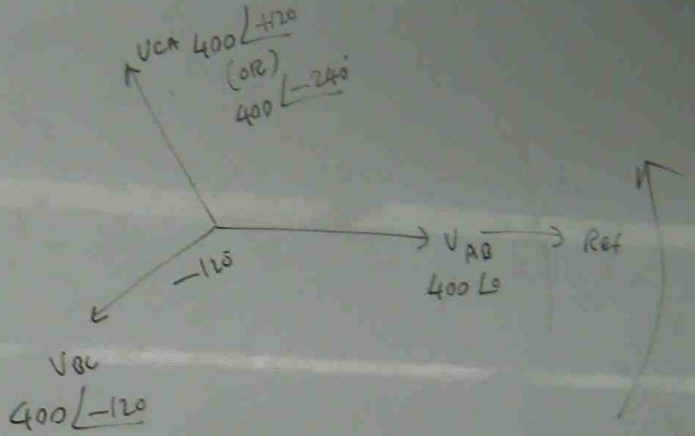
BALANCED 3φ DELTA







LINE VOLTAGE IS 400V

PHASE SEQUENCE IS ABC

FIND PHASE CURRENTS AND LINE CURRENTS.

△

PHASE VOLTAGE = LINE VOLTAGE

$V_{AB} = 400V$

$V_{BC} = 400V$

$V_{CA} = 400V$

$$I_{AB} = \frac{V_{AB}}{Z_{AB}} = \frac{400\angle 0}{50\angle 0} = 8\angle 0 \text{ A}$$

$$I_{BC} = \frac{V_{BC}}{Z_{BC}} = \frac{400\angle -120}{50\angle 0} = 8\angle -120 \text{ A}$$

$$I_{CA} = \frac{V_{CA}}{Z_{CA}} = \frac{400\angle 120}{50\angle 0} = 8\angle 120 \text{ A}$$

Flow in currents = Flow out current

$I_A + I_{CA} = I_{AB}$

$I_A = I_{AB} - I_{CA}$

$= 8\angle 0 - 8\angle 120$

$= 8(\cos 0 + j\sin 0) - 8(\cos(+120) + j\sin(+120))$

$= 8(1 + j0) - 8(-0.5 + j(+0.866))$

$= 8 - 8(-0.5 + j0.866)$

$= 8 + 4 - j7$

$= 12 - j7$

$I_A = \sqrt{12^2 + 7^2}\ \angle -\tan^{-1}\frac{7}{12}$

$= 13.89\ \angle -30.2^\circ$ A

(B)

$I_B + I_{AB} = I_{BC}$

$I_B = I_{BC} - I_{AB}$

$= 8\angle -120 - 8\angle 0$

$= 8(\cos(-120) + j\sin(-120)) - 8(\cos 0 + j\sin 0)$

$= 8(-0.5 - j0.866) - 8(1 + j0)$

$= -4 - j7 - 8$

$= -12 - j7$

$= \sqrt{12^2 + 7^2}\ \angle -(180 - \tan^{-1}\frac{7}{12})$

$I_B = 13.8\ \angle -(180 - 30.2)$

$13.8\ \angle -149.8$ A

$\tan^{-1}\frac{7}{12}$

$-(180 - \tan^{-1}\frac{7}{12})$

0

-180

(C)

$I_C + I_{BC} = I_{CA}$

$I_C = I_{CA} - I_{BC}$

$= 8\angle 120 - 8\angle -120$

$= 8(\cos 120 + j\sin 120) - 8(\cos$

$+j$

$= 8(-0.5 + j0.866) - 8(-$

$= -4 + j6.9 + 4 +$

$= j6.9 + j6.9$

$= j13.8$

$I_C = 13.8\ \angle 90$

(A) Flow in currents = Flow out current

$I_A + I_{AC} = I_{BA}$

$I_A = I_{BA} - I_{AC}$

$= 8\angle -120 - 8\angle 0$

$= 8\left[\cos(-120) + j\sin(-120)\right] - 8(\cos 0 + j\sin 0)$

$= 8(-0.5 - j0.866) - 8(1 + j0)$

$= -4 - j6.9 - 8 + j0$

$= -12 - j6.9$

$= \sqrt{12^2 + 6.9^2}\ \angle -\left(180 - \tan^{-1}\frac{6.9}{12}\right)$

$= 13.8\angle -(180 - 30)$

$= 13.8\angle -150°$ A

(B)

$I_B + I_{CB} = I_{BA}$

$I_B = I_{BA} - I_{CB}$

$= 8\angle 0 - 8\angle 120$

$= 8(\cos 0 + j\sin 0) - 8(\cos 120 + j\sin 120)$

$= 8(1 + j0) - 8(-0.5 + j0.866)$

$= 8 + 4 - j6.9$

$= 12 - j6.9$

$= \sqrt{12^2 + 6.9^2}\ \angle -\tan^{-1}\frac{6.9}{12}$

$I_B = 13.8\angle -30.2°$

(C)

$I_C + I_{AC} = I_{CB}$

$I_C = I_{CB} - I_{AC}$

$= 8\angle 120 - 8\angle -120$

$= 8(\cos 120 + j\sin 120) - 8(\cos(-120) + j\sin(-120))$

$= 8(-0.5 + j0.866) - 8(-0.5 - j0.866)$

$= -4 + j6.9 + 4 + j6.9$

$= j13.8$

$I_C = 13.8\angle 90°$ Amp.