GIVEN: FIG. P 2-2

FIND: A) V_ϕ I_ϕ FOR LOAD 1 IF Y

B) V_ϕ I_ϕ FOR LOAD 2 IF Δ

C) P, Q, |S| WITH SWITCH OPEN

D) I_L SWITCH OPEN

E) P, Q, |S| WITH SWITCH CLOSED

F) I_L SWITCH CLOSED

G) COMPARE LINE CURRENTS

SOLN: A) 480 IS V_L SO FOR Y... $V_\phi = \frac{V_L}{\sqrt{3}} = \underline{\underline{277V}}$

$P = V_\phi I_\phi pf$ $\quad \frac{100KW}{3} = 277(I_\phi)\,0.9$

$I_\phi = \underline{\underline{133.7A}}$

B) $V_L = V_\phi$ FOR Δ SO $V_\phi = 480V$

$S = 3 V_\phi I_\phi$ $\quad 80KVA = 3 I_\phi (480)$

$I_\phi = \underline{\underline{55.56}}$ A

C) FOR LOAD 1: $P_1 = 100KW$ $\quad Q_1 = P_1 \tan(\cos^{-1} 0.9)$

$= 48.4$ KVAR

FOR LOAD 2: $P_2 = S\,pf$

$= 64KW$ $\quad Q_2 = S \sin(\cos^{-1} 0.8)$

$= 48$ KVAR

SO, $P_T = P_1 + P_2 = \underline{\underline{164KW}}$

$Q_T = Q_1 + Q_2 = \underline{\underline{96.4KVAR}}$

D) $P_T = \sqrt{3}\, V_L I_L \cos\theta$ $\qquad \theta = \tan^{-1}\left(\frac{Q_T}{P_T}\right)$

$\theta = 30.45°$

$$I_L = \frac{164\text{ KW}}{\sqrt{3}\,(480)\cos(30.45)}$$

$$= \underline{\underline{228.8\text{A}}}$$

E) $P_3 = 80\text{KW}$ $\qquad Q_3 = P_3 \tan(\cos^{-1} 0.85)$

$= -49.6\text{ KVAR}$

↑ BECAUSE IT'S LEADING!

$P_T = P_1 + P_2 + P_3$

$= \underline{\underline{244\text{KW}}}$ $\qquad Q_T = Q_1 + Q_2 + Q_3 = \underline{\underline{46.8\text{ KVAR}}}$

F) $$I_L = \frac{244\text{ KW}}{\sqrt{3}\,(480)\cos\left(\tan^{-1}\frac{46.8}{244}\right)}$$

$$= \underline{\underline{298.8\text{A}}}$$

G) LINE CURRENTS AT THE LOADS ARE...

$I_1 = 133.6\text{A}$ $\quad I_2 = 96.2\text{A}$ $\quad I_3 = 113.2\text{ A}$

WHICH SUM TO 343A ... BUT, IN F)

$I_L = 298.8\text{A}$ ... IT'S LOWER BECAUSE

LOAD 3 IS A <u>LEADING</u> PF AND IS

OFFSETTING TOTAL Q (LOWERING)

GIVEN: FIG. P 2-3

FIND: ALL LINE AND PHASE VOLTAGES & CURRENTS

SOLN: FOR A Y SOURCE ... $V_L = (\sqrt{3}\angle 30)\, V_\phi$

SO... $V_{ab} = \sqrt{3}\angle 30\,(120\angle 0) = \underline{208\angle 30^\circ}$ V

$V_{bc} = 208\angle -90^\circ$ V
$V_{ca} = 208\angle 150^\circ$ V
} POS. SEQ.

AND $I_{ab} = \dfrac{V_{ab}}{Z} = \dfrac{208\angle 30}{10\angle 20} = \underline{20.8\angle 10^\circ}$ A

$I_{bc} = 20.8\angle -110^\circ$ A
$I_{CA} = 20.8\angle 130^\circ$ A
} POS. SEQ.

FOR Δ ... $I_L = (\sqrt{3}\angle -30)\, I_\phi$

SO... $I_a = \sqrt{3}\angle -30\,(20.8\angle 10) = \underline{36\angle -20^\circ}$ A

$I_b = 36\angle -140^\circ$ A
$I_c = 36\angle 100^\circ$ A
} POS. SEQ.