P 3.3

C_1 @ 13.8 KV has 5 MVA

$I_1 = \dfrac{5\,MVA}{\sqrt{3}(13.8\,KV)} = 209\,A \qquad X_{C_1} = \dfrac{13.8\,KV}{\sqrt{3}(209\,A)} = 38.1\,\Omega$

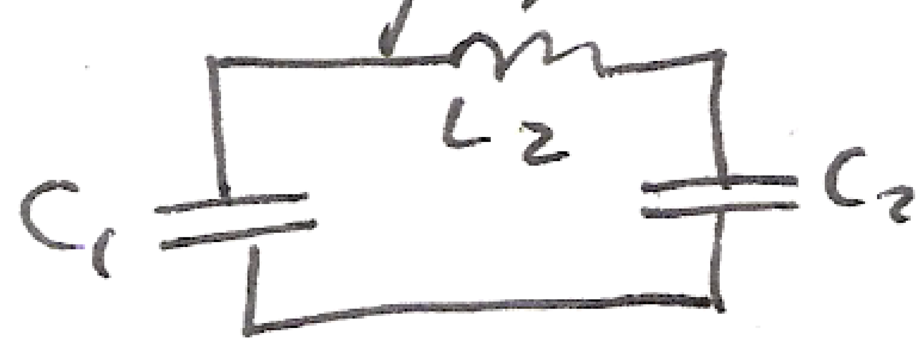
$C_1 = \dfrac{1}{\omega X_c} = \dfrac{1}{(377)(38.1\,\Omega)} = \qquad C_1 = 69.62\,\mu F$

$C_2 = C_1\left(\frac{3}{5}\right) = 41.78\,\mu F = \qquad C_2 = 41.78\,\mu F$

$L_s \rightarrow \bar{V}_{Ln} = \bar{I}_L \bar{Z}_\phi \rightarrow X_L = \dfrac{|V_{LL}|}{\sqrt{3}(20\,KA)} = 0.3984\,\Omega$

$L_s = X_s/\omega = 0.3984/377 \rightarrow \qquad L_s = 1.057\,mH$

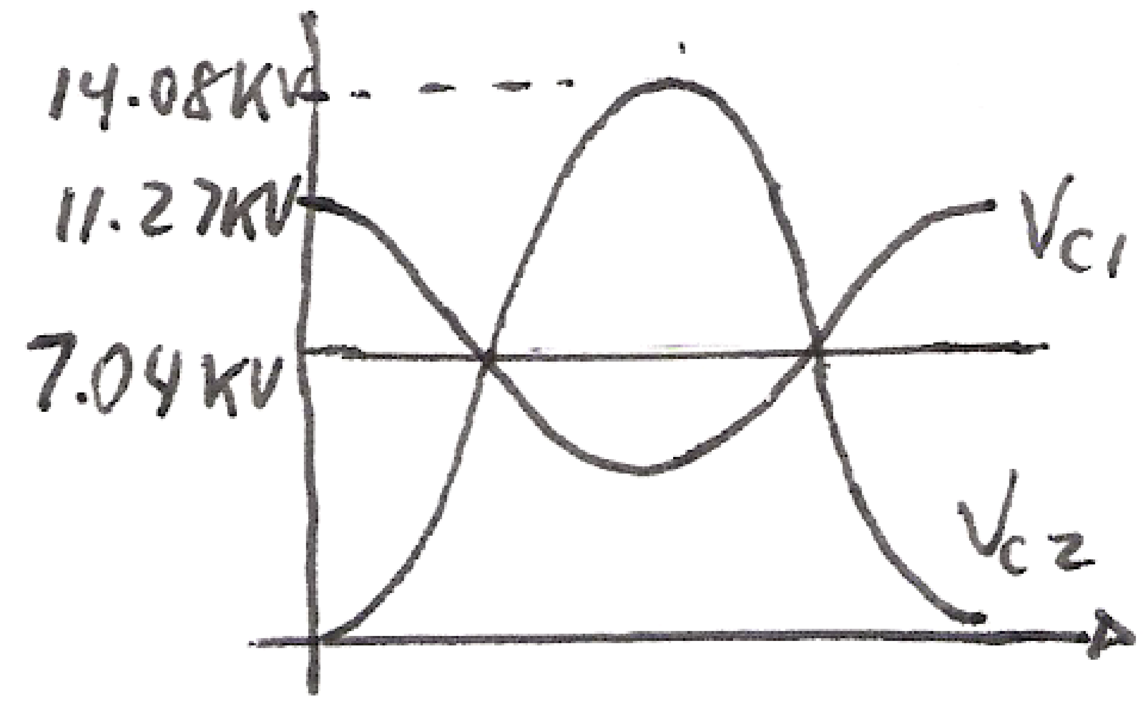
When S closes if the f_0 is high, one can analize by super posision and



C_1 & C_2 in series so,

$\omega_0 = \sqrt{\dfrac{C_1 C_2 L_2}{C_1 + C_2}} \cong 35.7K\,\frac{rad}{s}$ or $f_0 \equiv 5.7\,KHz$

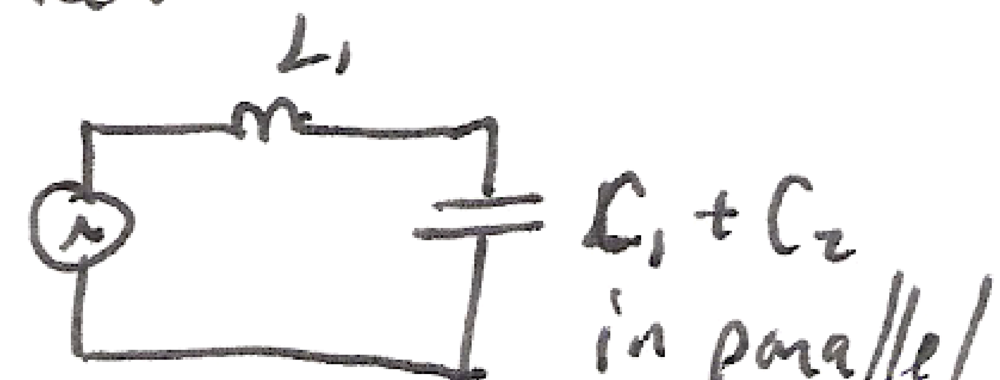
$V_\infty = \dfrac{C_1 V_{C_1}(0)}{C_1 + C_2} = 7.04\,KV$



$V_{C2\,peak} \cong 2\,(7.04\,KV)$ since it started at zero

$V_{C1\,peak} = \dfrac{\sqrt{2}}{\sqrt{3}}\,13.8\,KV = 11.27\,KV$

In the second event $L_2 \rightarrow 0$ compared to L_1, then



$Z_0 = \left[\dfrac{L_1}{C_1 + C_2}\right]^{\frac{1}{2}} = 3.08\,\Omega$

$V_{peak} = [7.04 + 2(11.27 - 7.04)]\,KV$

$V_{peak} = 15.5\,KV$

$I_{peak} = \dfrac{(11.27 - 7.04)\,KV}{3.08} = 1373\,A$