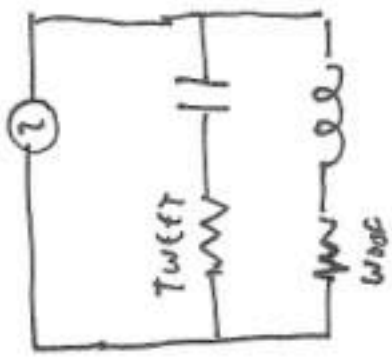
Homework 14 solutions

31.40



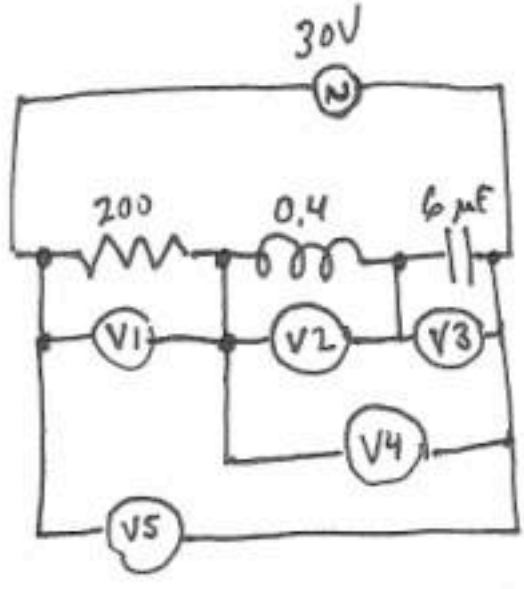
$$Z_T = \sqrt{\left(\frac{1}{\omega C}\right)^2 + R^2}$$

$$Z_W = \sqrt{(\omega L)^2 + R^2}$$

Currents equal (in magnitude) when $Z_T = Z_W$ because $V = IZ$.

Crossover is $Z_T = Z_W \rightarrow \frac{1}{\omega C} = \omega L \quad \omega = \frac{1}{\sqrt{LC}}$

31.42



$\omega = 200$ rad/sec

$$Z_{TH} = \sqrt{R^2 + \left(\omega L - \frac{1}{\omega C}\right)^2}$$

$= 779\,\Omega$

$V = IZ \rightarrow I = 38$ mA.

To get RMS values $\times \frac{1}{\sqrt{2}}$.

$V_1 = IR = 7.7$ V

$V_2 = IX_L = I\omega L = 3.1$ V

$V_3 = IX_L = I/\omega C = 32.1$ V

$V_4 = IZ_{LC} \quad Z_{LC} = \omega L - \frac{1}{\omega C} \Rightarrow V_4 = 29$ V.

Check $29^2 + 7.7^2 = 30^2$ ✓