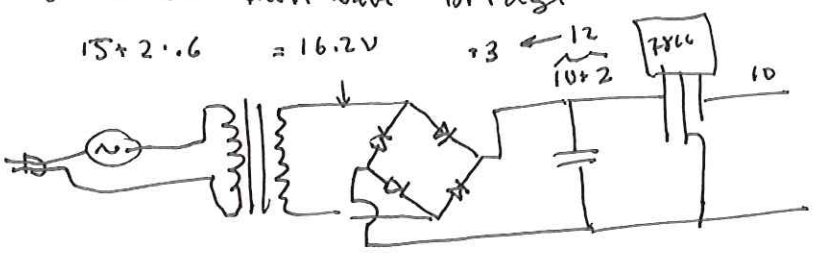
1) My choice: full wave bridge



$C \Delta V = Q = IT \leftarrow \frac{1}{120}$

$C = \frac{\frac{1}{2}\cdot\frac{1}{120}}{3} = 1.39\,mF$

fwx: $120 \cdot I = 16.2 \cdot \frac{1}{2}$

$I = .0675\,A$

(bridge)

rms: $\frac{16.2}{\sqrt{2}} = 11.5V$

Power $= (\frac{3}{2}+2)(.5)$

$= 1.75\,W$

2) $X_L = \omega L = 2\pi \cdot 3500 \cdot .01 = 220\Omega$

$X_C = \frac{1}{\omega C} = \frac{1}{2\pi \cdot 3500 \cdot 10^{-7}} = 455\Omega$

$\frac{1}{Z_{th}} = j\omega C + \frac{1}{j\omega L + R}$

$Z_{th} = 440 + 14.5i$

$439.4 \quad 14.2$

$= 440 \angle 1.9^\circ$

↑ V leads!

$I_{left} = \frac{V}{j\omega L + R} = \frac{5}{220 + 220i}$

$= (11.4 - 11.4i)\,mA$

$= 16.1\,mA \angle -45^\circ$

↖ $I = (A)$

$I = \frac{V}{Z}$

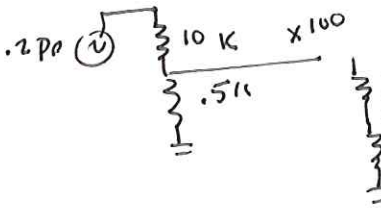
$= \frac{5}{440} \angle -1.9^\circ$

↖ 11.4 mA

$V_1 = |I_{left}||\omega L| = 16.1 \cdot 220 = 3.54V$

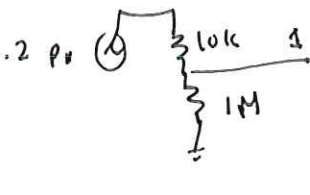
↑ same for V_2 as $\omega L = R$

(3)



$\frac{8}{40} \cdot 100 \cdot \frac{.5}{10.5} \left(\frac{.2}{2\sqrt{2}}\right) = 67.3\,mV$

$\text{Power} = \frac{V_{rms}^2}{R} = \frac{(67.3\,mV)^2}{8} = .567\,mW$

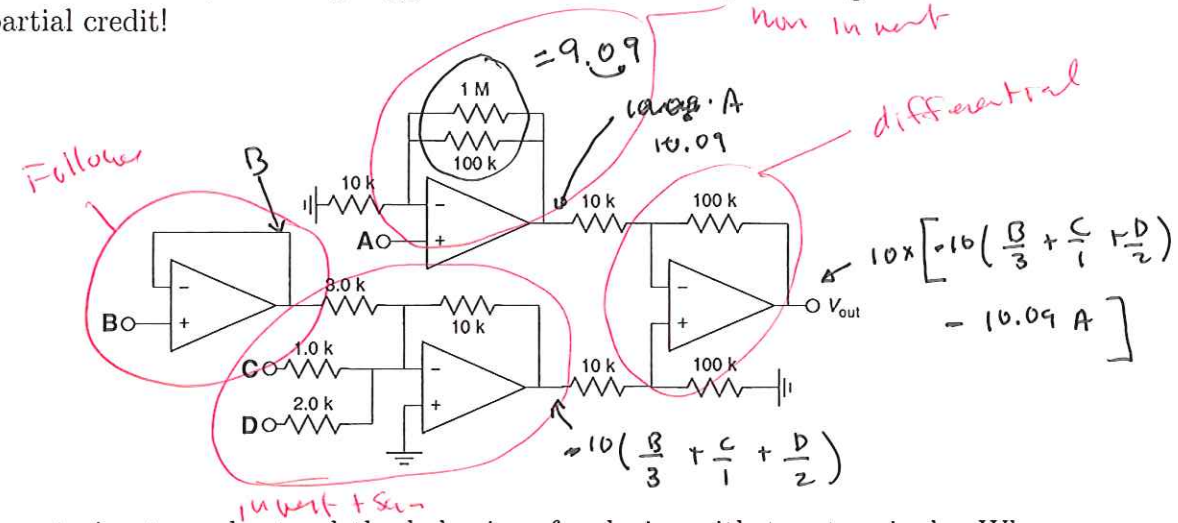


$\frac{8}{9}\left(\frac{.2}{2\sqrt{2}}\right) = 62.9\,mV$

$\text{Power} = \frac{V_{rms}^2}{R} = .494\,mW$

$\frac{8}{10{,}008}\left(\frac{.2}{2\sqrt{2}}\right) = 56.5\,\mu V \rightarrow \text{Power} = 4 \times 10^{-10}\,W$

4. The below mess-of-op-amps circuit has four input voltages: A, B, C, D. Find the equation for the output voltage V_{out} in terms of the four input voltages. Show work for partial credit!



5. You are trying to understand the behavior of a device with two terminals. When you measure the voltage between the two terminals with a digital voltmeter you get 5 V. When you attach a 500 Ω resistor between the two terminals you measure 4 V. Calculate component values for a Thévenin equivalent circuit for the device and draw that equivalent circuit. If you attach a 100 Ω resistor between the terminals, how much power will be dissipated in that resistor?

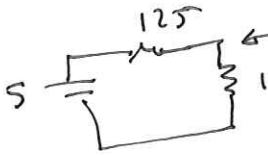
$V_{TH}=5$

$4V = \frac{500}{500+R}\,5$

$\frac{4}{5}(500+R) = 500$

$R = 500\left(\frac{5}{4}-1\right)$

$= 125\,\Omega$



$\frac{100}{225}\cdot 5 = 2.22V$

$\frac{V^2}{R} = 49.4\ mW$