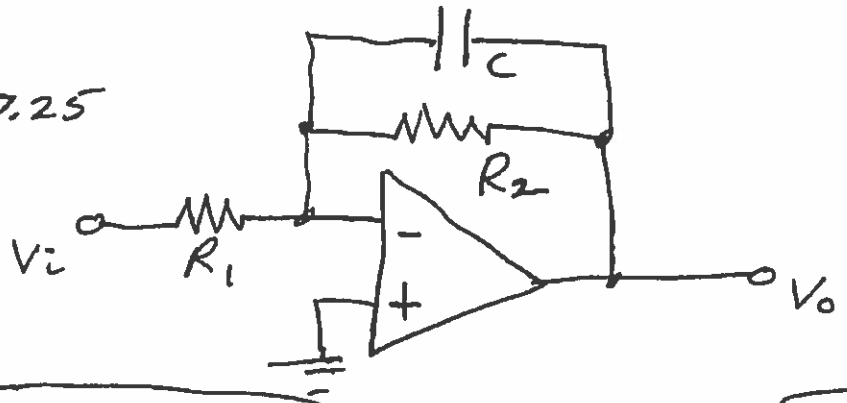
EE352 HW8 Solutions

(1.) Text 17.25



$$T(s) = \left(-\frac{R_2}{R_1}\right)\left[\frac{1}{1+R_2Cs}\right]$$

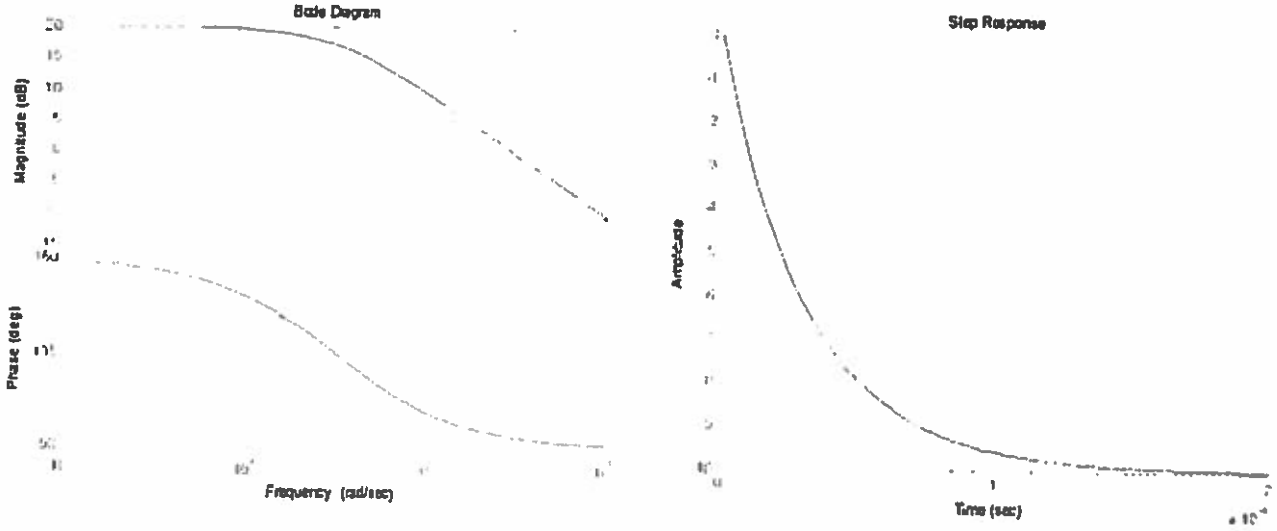
$R_{in} = 12K \Rightarrow R_1 = 12K$

$\left|-\frac{R_2}{R_1}\right| = 10 \Rightarrow R_2 = 120K$

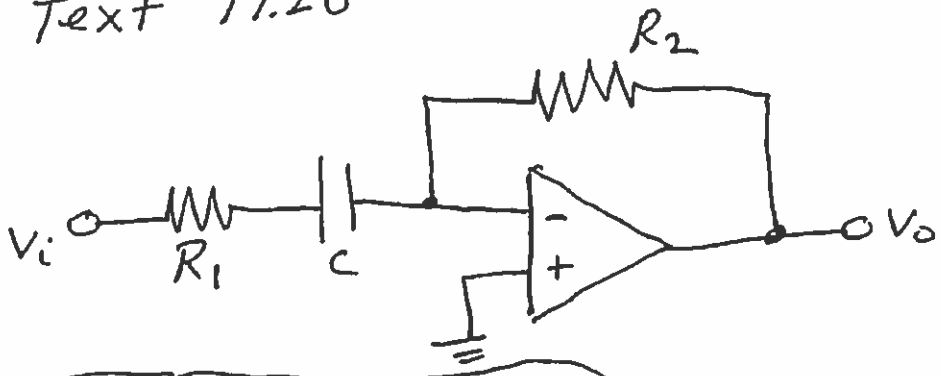
$\omega_H = \frac{1}{R_2C} = 2\pi(5KHz)$

$\Rightarrow C = 265pF$

Matlab Bode Plots



(2.) Text 17.26



$$T(s) = \left(-\frac{R_2}{R_1}\right)\left[\frac{R_1 C s}{1 + R_1 C s}\right]$$

$R_{in} = 120K \Rightarrow R_1 = 120K$

$\left|\frac{-R_2}{R_1}\right| = 1 \Rightarrow R_2 = 120K$

$\omega_L = \frac{1}{R_1 C} = 2\pi(200\,Hz)$

$\Rightarrow C = 6.6\,nF$

Matlab Plots

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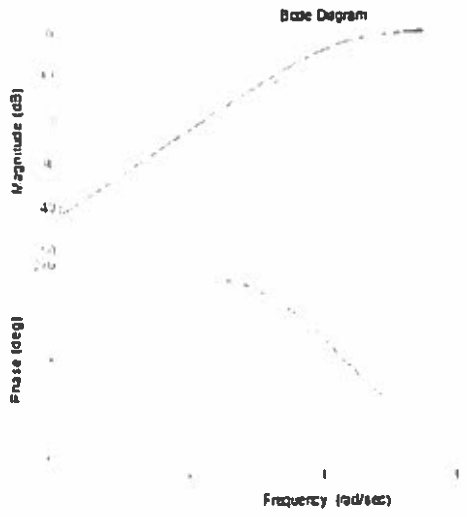
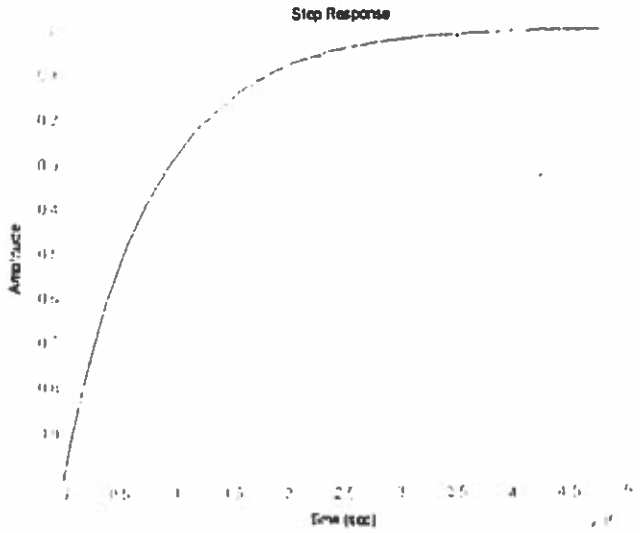
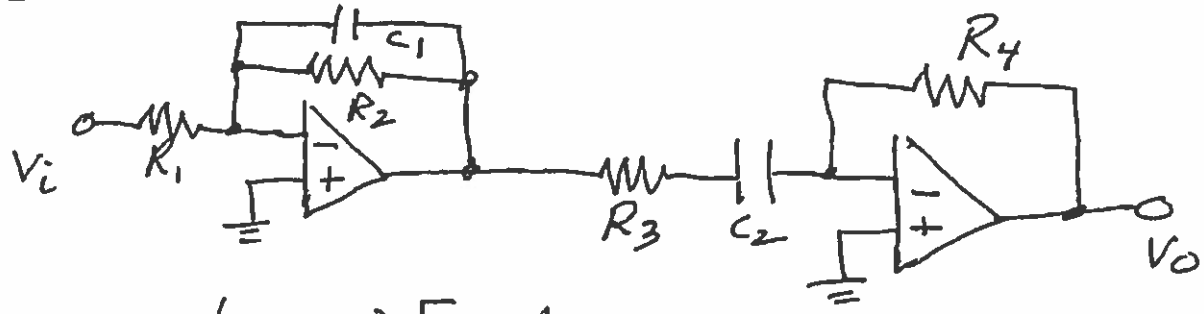




(3.) Text 17.29



$$T(s) = \left(\frac{R_2 R_4}{R_1 R_3}\right)\left[\frac{R_3 C_2 s}{(1+R_3 C_2 s)(1+R_2 C_1 s)}\right] = A_m \frac{s/\omega_L}{(1+s/\omega_L)(1+s/\omega_H)}$$

$A_m = \frac{R_2 R_4}{R_1 R_3} = 4$; $\omega_L = \frac{1}{R_3 C_2} = 2\pi(50\text{Hz})$; $\omega_H = \frac{1}{R_2 C_1} = 2\pi(50\text{kHz})$

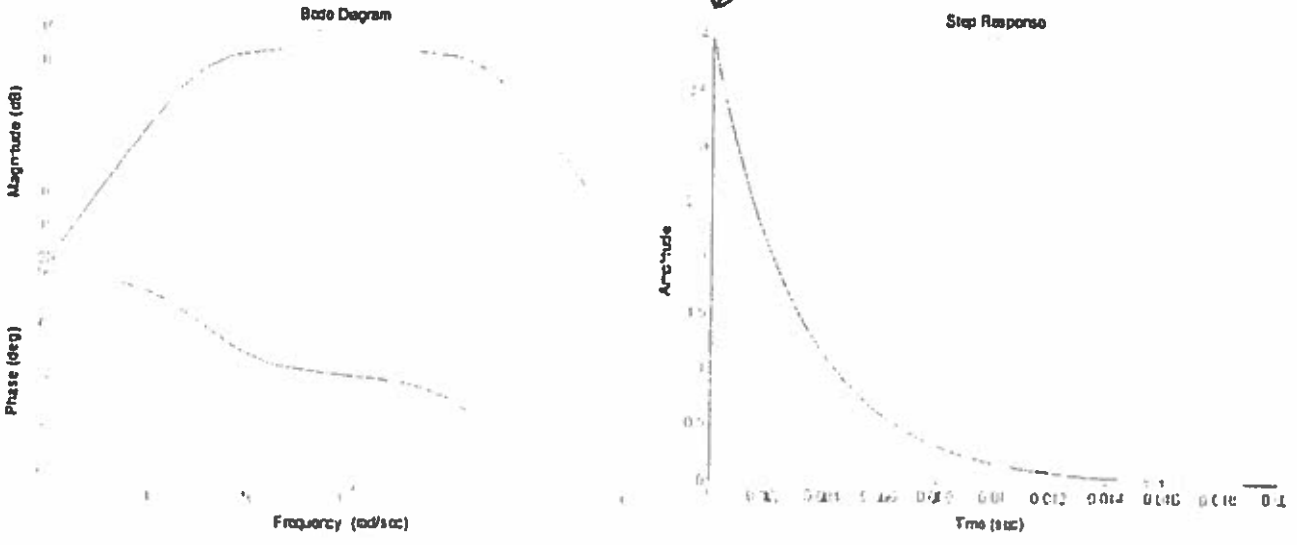
All R's $\leq 100K$; $R_{in} = Max \Rightarrow$ $R_1 = 100K$

Select $R_2 = R_4 = 100K$ $\Rightarrow$ $R_3 = 25K$

$\Rightarrow$ $C_1 = 31.8\text{pF}$ $C_2 = 127\text{nF}$

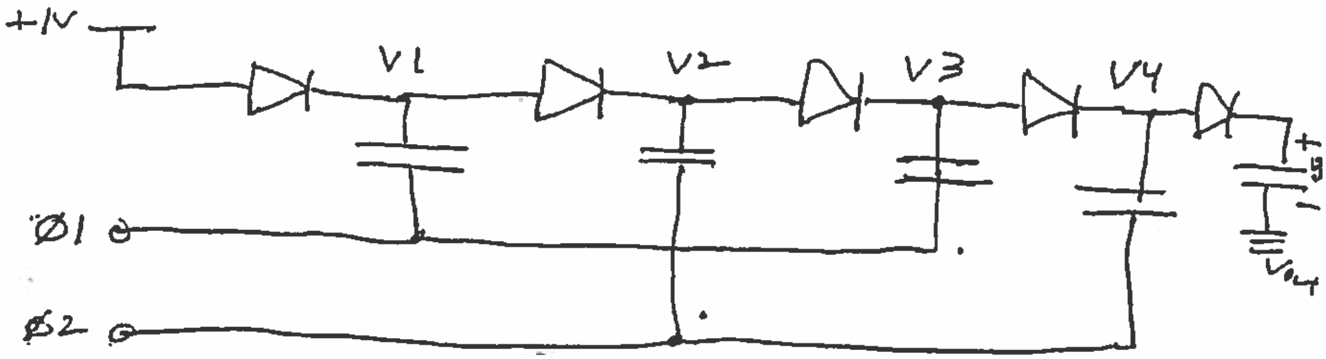
(This is just one of an ~~∞~~ infinite # of valid solutions)

Matlab Bode Plots



(4.) ~~Optional Bonus Problem (25 pts)~~

"Voltage Quintuplor"



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Ø2 0 0 0 1 0 0 0 1 0 0 0 1 0 0 0 1 0 0 0 1 0 0 0 1 0 0 0

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V2 1 2 1 2 1 2 2 3 2 2 2 3 2 2 2 3 2 2 2 3 2 2 2 3 2 2 2

V3 1 2 1 2 2 3 2 3 3 4 3 3 3 4 3 3 3 4 3 3 3 4 3 3 3 4 3

V4 1 2 2 3 2 3 3 4 3 4 4 5 4 4 4 5 4 4 4 5 4 4 4 5 4 4 4

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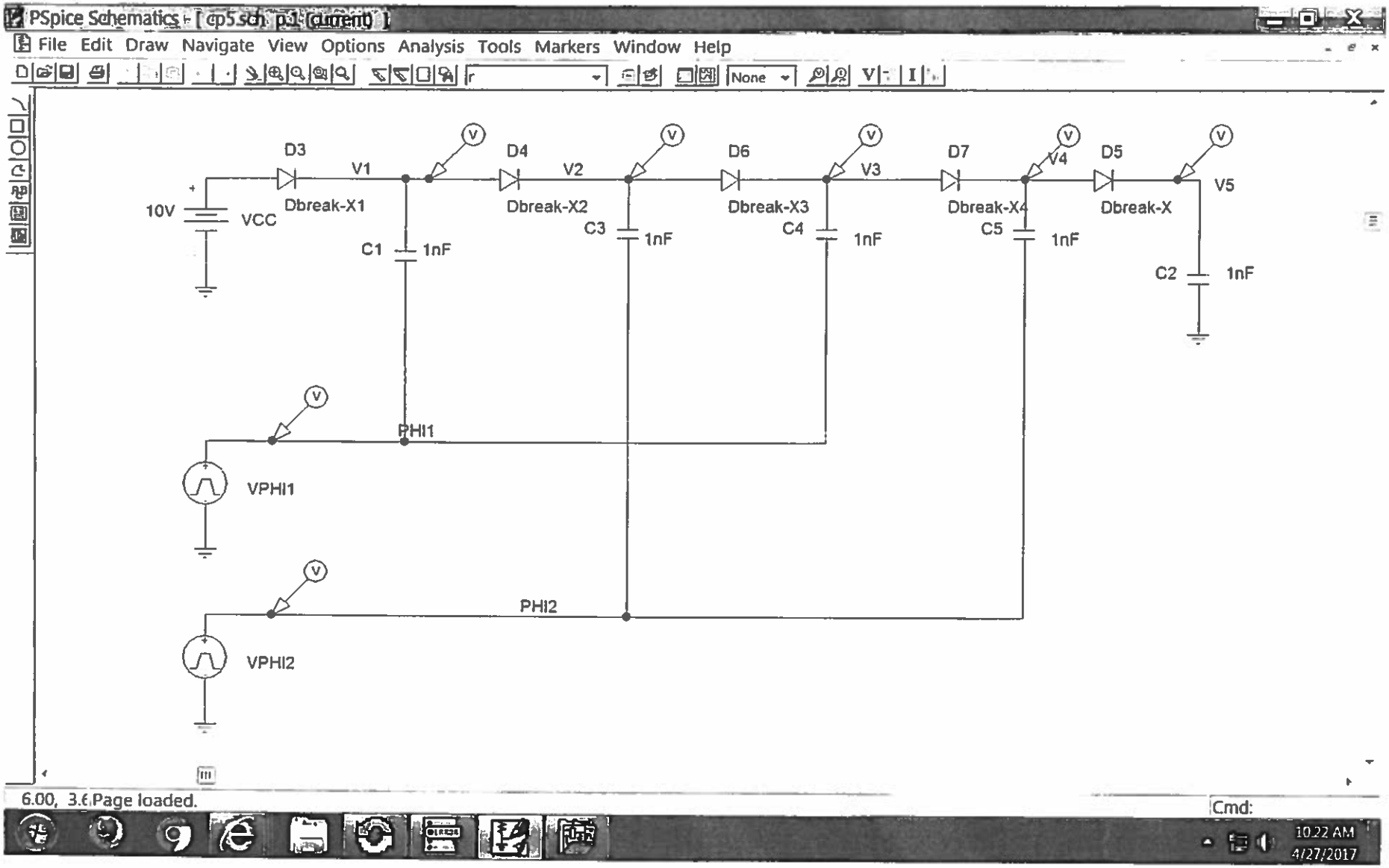
Vout → 5V ☺

Quintuplor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C1 1nF
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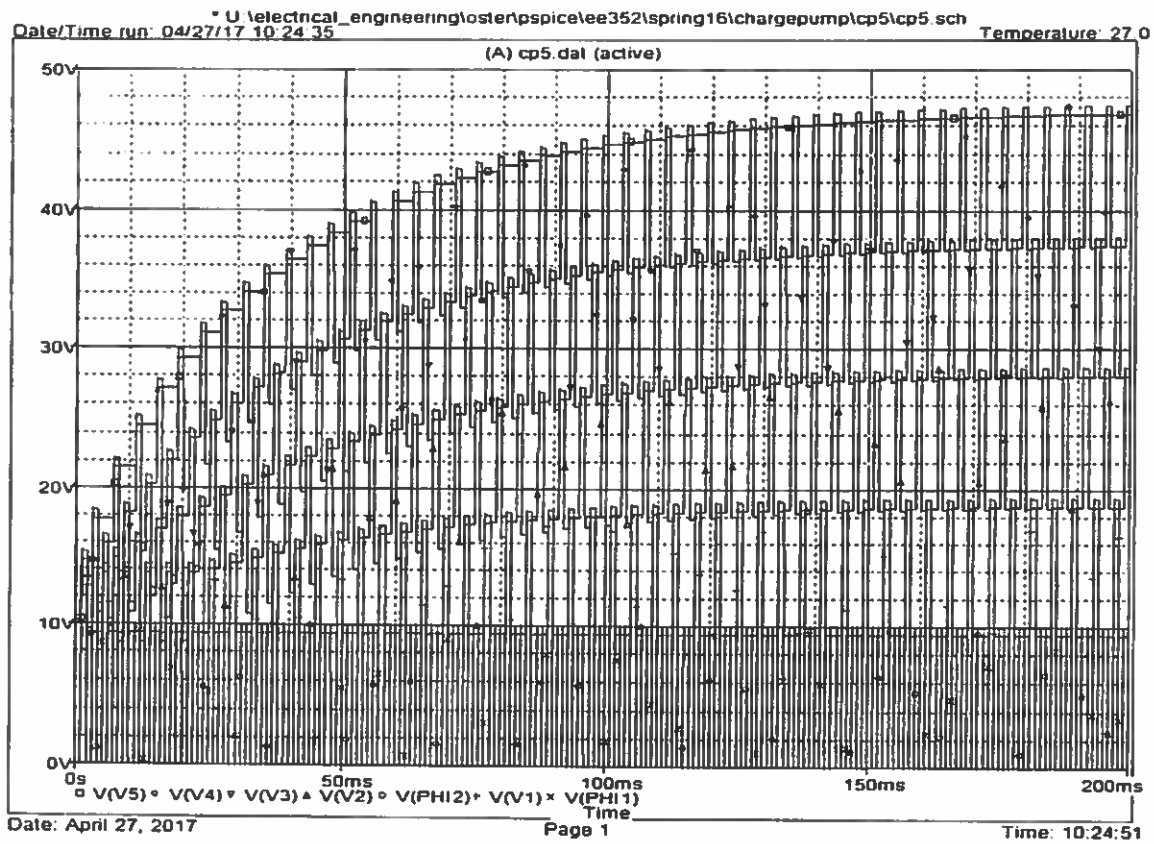

Page 1

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