

ECSE 2010
Electric Circuits
Exam 3
Fall 2006 - Millard

Name _____

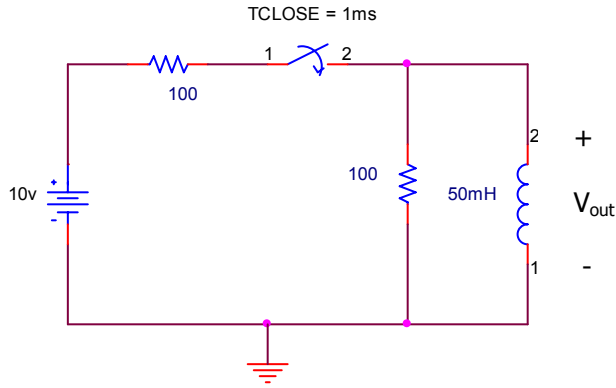
Problem No.	Pts.	Score
1	20pts	
2	30pts	
3	10pts	
4	20pts	
5	20pts	
Total	100pts	

Please Note:

- * Place all your answers in the spaces provided.
- * You MUST show ALL your work or thoroughly describe your solution process to receive any credit.

Problem 1 (20pts)

a.) The switch is open for a long time before closing at $t = .5\text{sec}$ in the circuit shown below. Find $V_{\text{out}}(s)$ for $t \geq 1\text{ms}$ and sketch $V_{\text{out}}(t)$ for $t \geq 0$. (10pts)

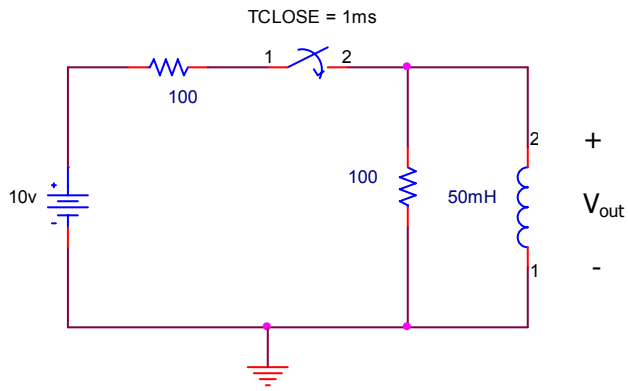


$V_{\text{out}}(s)$	
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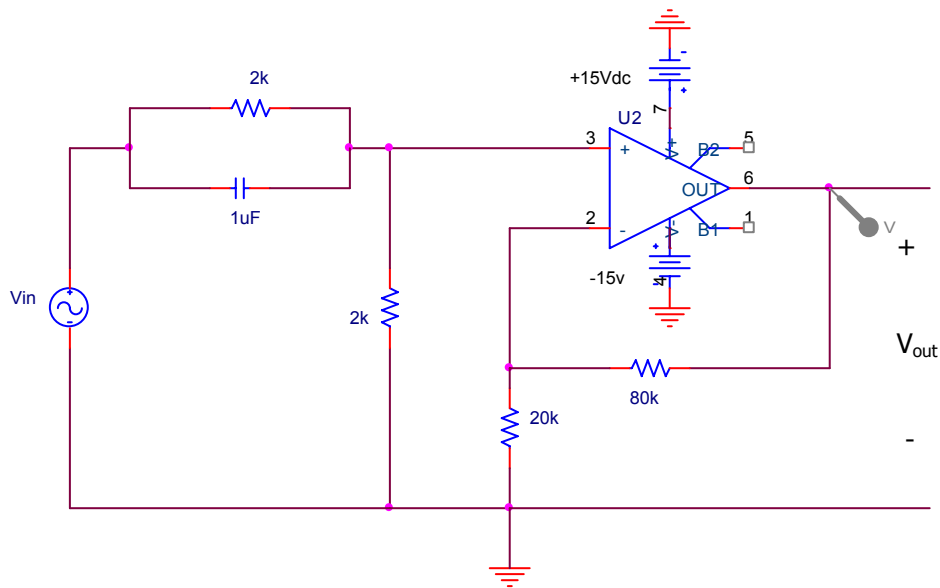
Problem 1 (cont)

b.) Find $V_{out}(t)$ for $t \geq 1\text{msec}$ given the circuit shown below, showing all pertinent values. (10pts)



$V_{out}(t)$	
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Problem 2 (30pts)

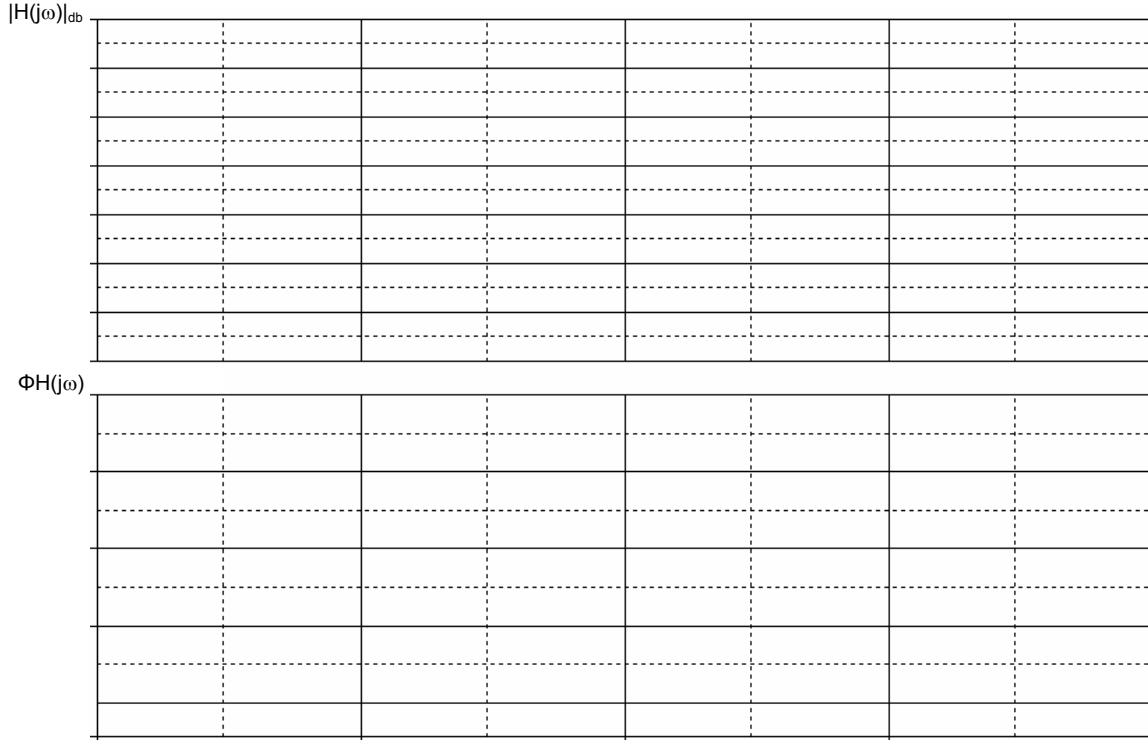


a.) Find $H(s) = \frac{V_{out}(s)}{V_{in}(s)}$ for the above circuit. (10pts)

H (s)	
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Problem 2 (cont)

b.) Sketch the asymptotic Bode plot $|H(j\omega)|$ and $\Phi H(j\omega)$ for the circuit shown in part (a). Please label your axes and critical values. (10pts)



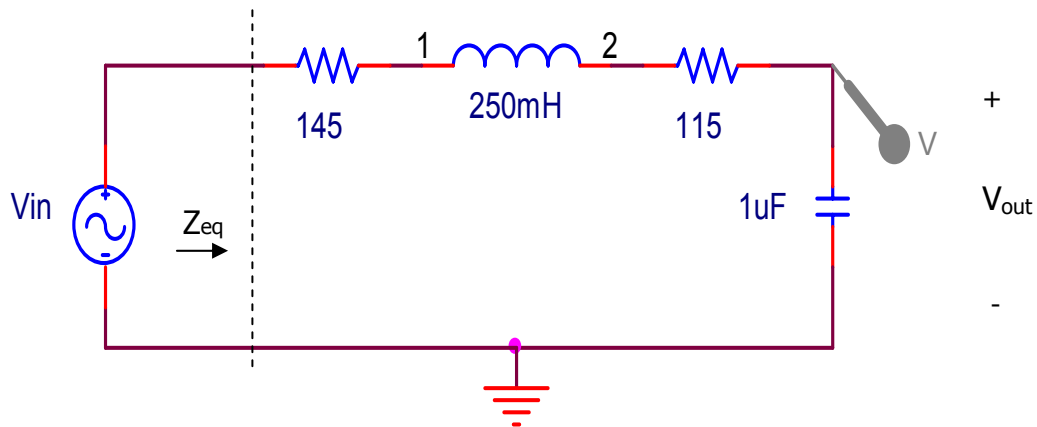
c.) For an input $V_{in}(t) = 5\cos(500t)$, what is the output voltage $V_{out}(t)$? (5pts)

$V_{out}(t)$	
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d.) For an input $V_{in}(t) = 1\cos(100kt)$, what is the output voltage $V_{out}(t)$? (5pts)

$V_{out}(t)$	
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Problem 3 (10pts)



a.) Determine the frequencies (ω , in radians/sec) where Z_{eq} , the equivalent load impedance of the circuit above, is either at a minimum or at a maximum. (6pts)

ω Z_{eq} (min)	
ω Z_{eq} (max)	

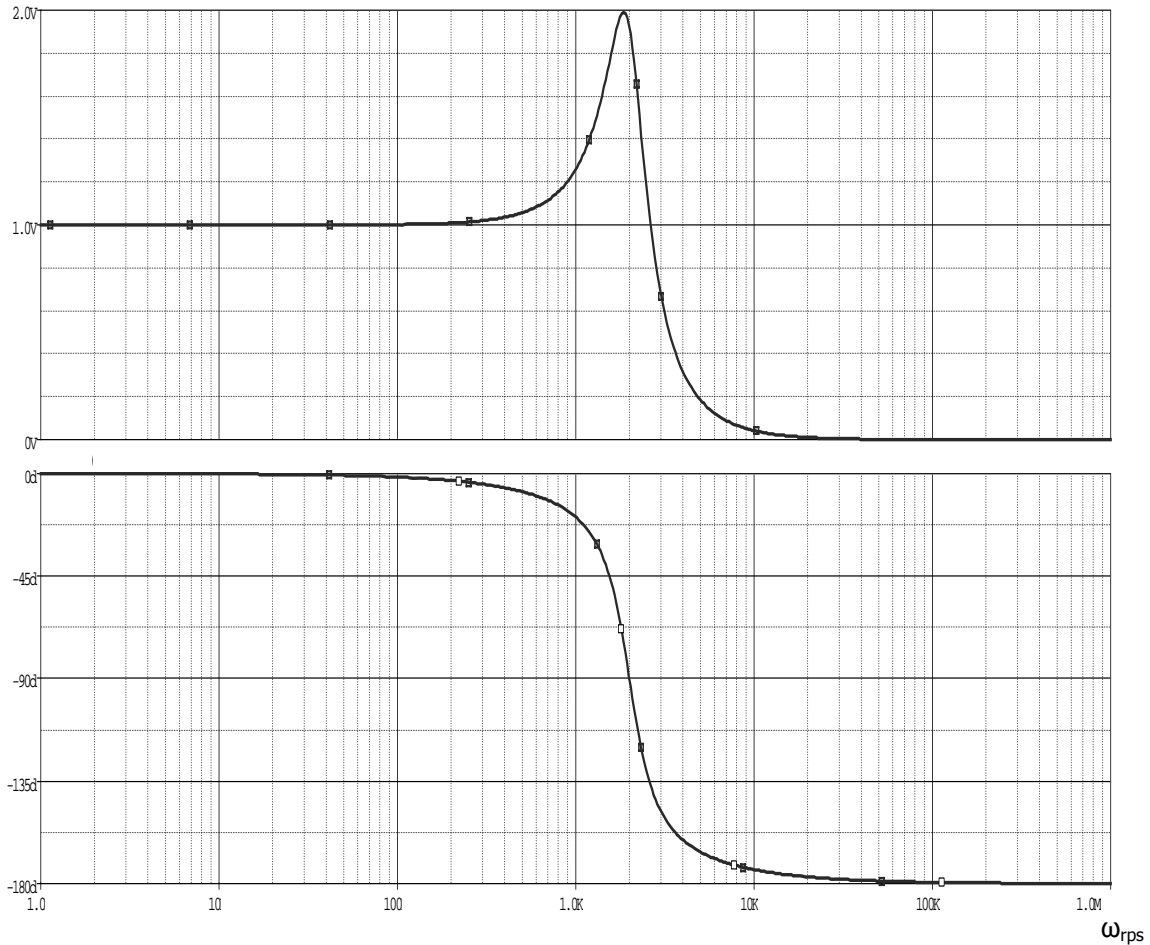
b.) What is $V_{out}(t)$ for $V_{in}(t) = 5\cos(\omega_0 t)$, where ω_0 is the resonant frequency? Please justify your response. (4pts)

$V_{out}(t)$	
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Problem 4 (20pts)

Name _____

Given the following frequency response:



a.) Would this response offer a good circuit for an ultrasonic signal? Please circle one and justify your response. (5pts)

Yes	No
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b.) What kind of filter does this circuit represent? (Circle any/all that may apply and explain your response in the space provided below.) (5pts)

Lowpass	Bandpass	Low Q	Notch
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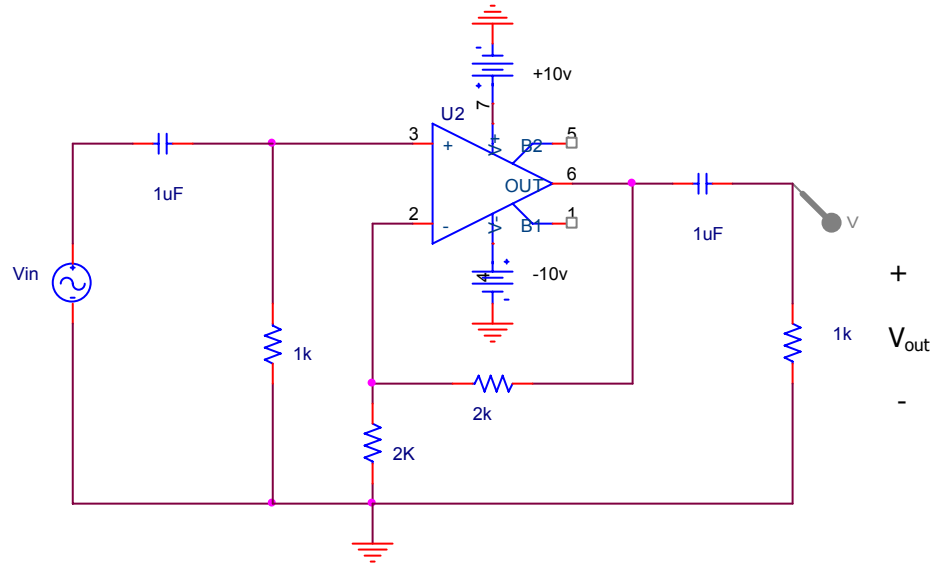
Problem 4 (cont)

c.) Design a circuit that would produce the frequency response shown above, using only one resistor, one inductor and one capacitor. (10pts)

Problem 5 (20pts)

Name _____

a.) Find $H(s) = \frac{V_{out}(s)}{V_{in}(s)}$ for the circuit shown. (5pts)



H(s)	
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Problem 5 (cont.)

Name _____

b.) What $V_{out}(t)$ would be produced if $V_{in}(t) = 5\cos(1_{rps}t + 45^\circ)$? Justify your response. (5pts)

$V_{out}(t)$	
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c.) What kind of filter could this circuit represent? (Circle one and explain your response in the space provided below.) (5pts)

2 nd order BPF	2 nd order HPF	2 nd order LPF	None of these
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d.) Could the same overall frequency response be produced with less components/devices? Please justify your response in the space below to get credit. (5pts)

Yes	No
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Extra space (if needed)

Name _____

Extra space (if needed)

Name _____