

ECSE 2010
Electric Circuits
Exam 3
Spring 2007

Name _____

Section (please circle one)

MR
10-12
Millard

MR
2-4
Abouzeid

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

Please Note:

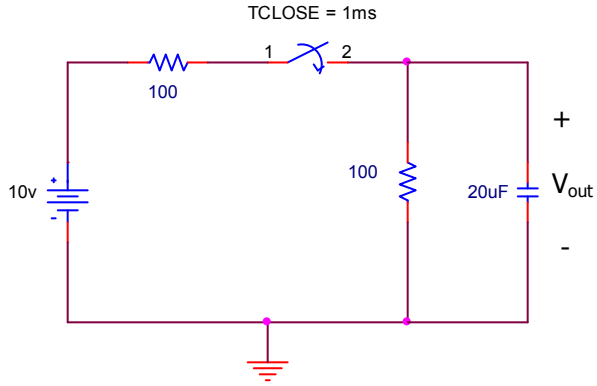
* Place all your answers in the spaces provided.

* You MUST show your work to receive any credit.

* **Assume ALL sources are turned ON at $t=0$, unless noted otherwise.**

Problem 1 (20pts)

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

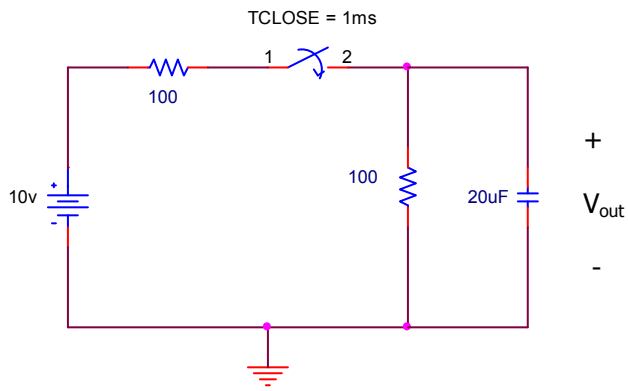


$V_{\text{out}}(s)$	
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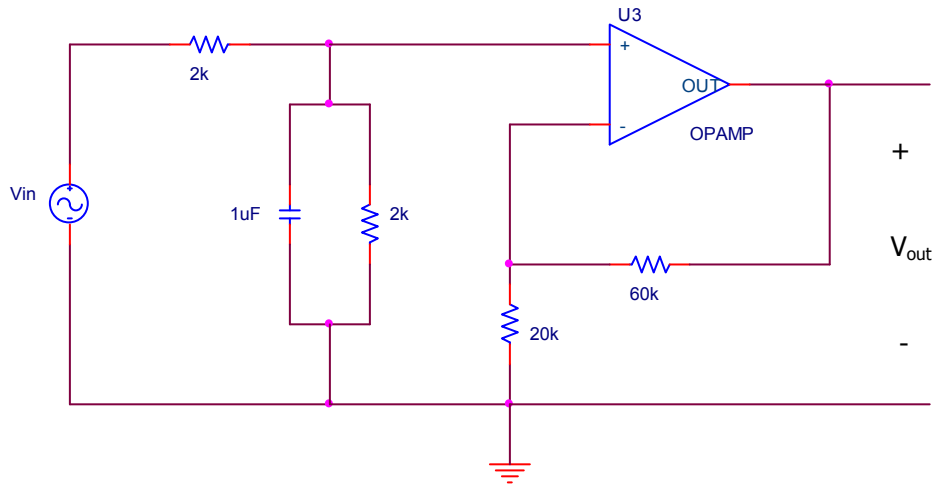
Problem 1 (cont)

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)

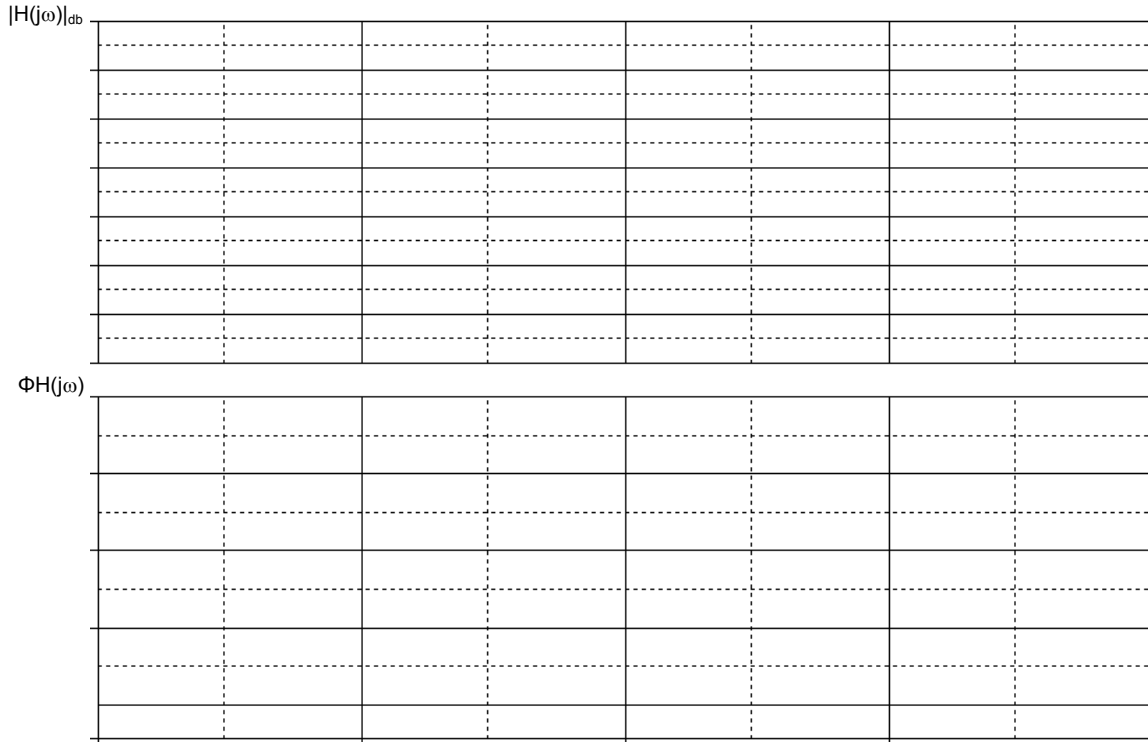


a.) Find $H(s) = \frac{V_{out}(s)}{V_{in}(s)}$ for the above circuit. (10pts)

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 $V_{in}(t) = 2\cos(1000t)$, what is the output voltage $V_{out}(t)$? (5pts)

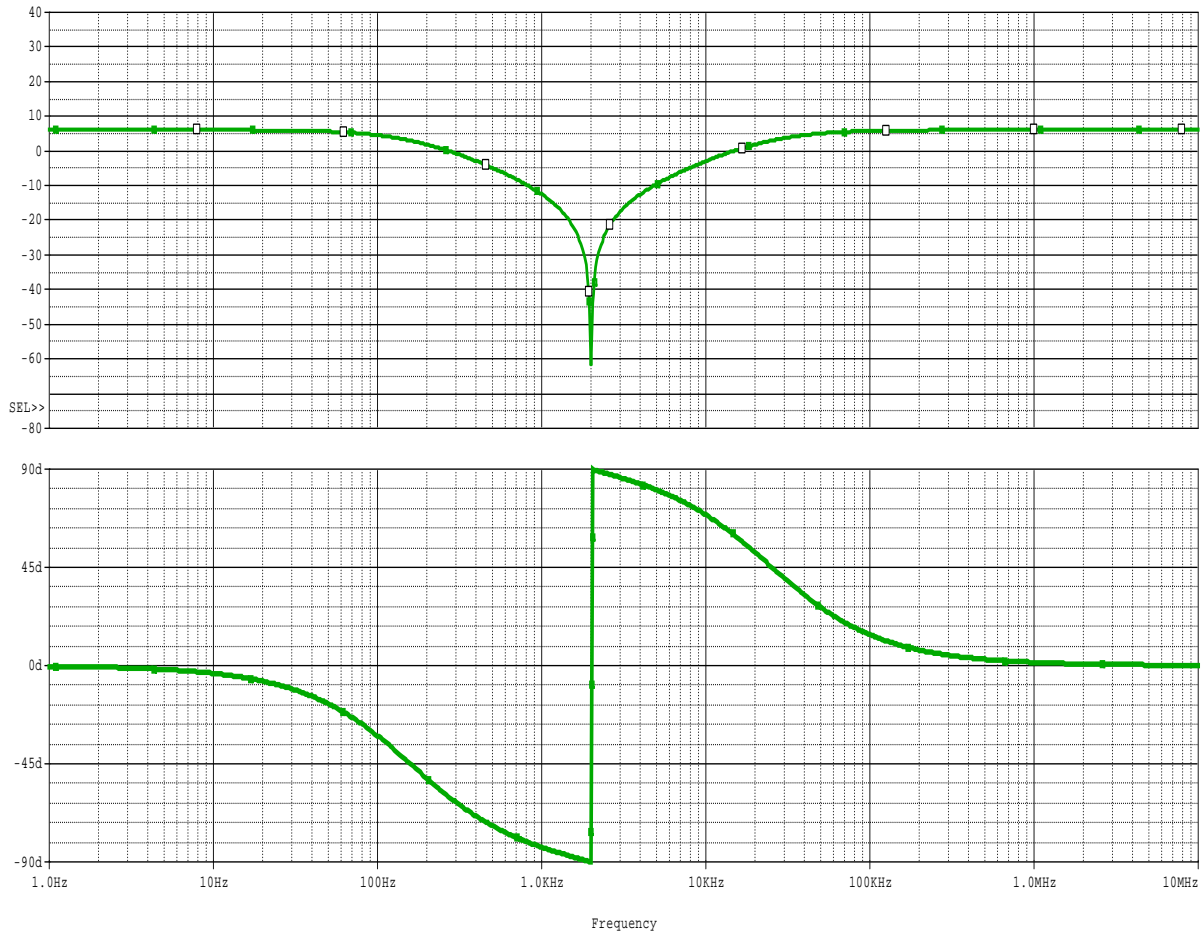
$V_{out}(t)$	
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d.) For an input $V_{in}(t) = 1\cos(20t + 45^\circ)$, what is the output voltage $V_{out}(t)$? (5pts)

$V_{out}(t)$	
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Problem 3 (20pts)

Given the following frequency response:



a.) Would this response offer a good circuit for a guitar tone control? Please circle one and justify your response. (5pts)

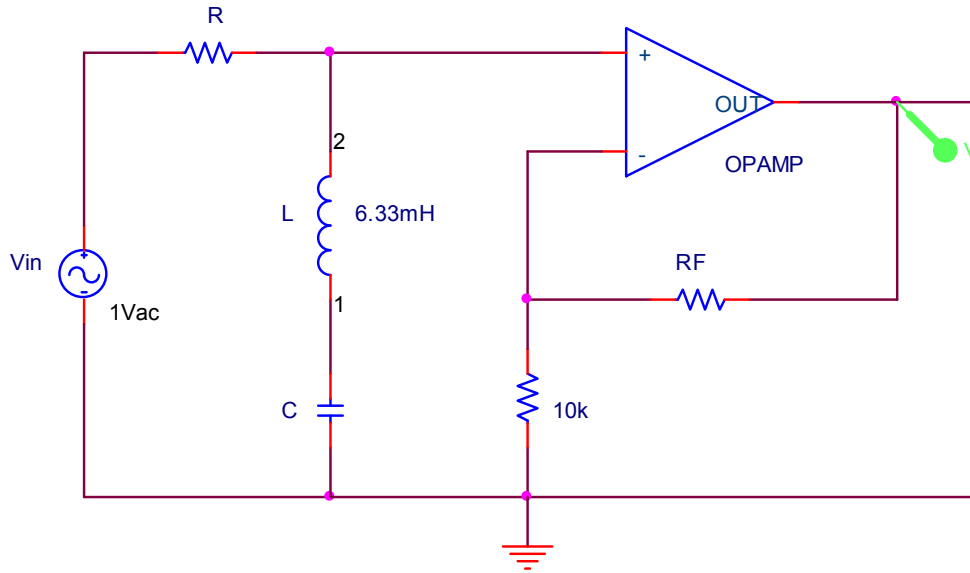
Yes	No
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b.) What kind of filter does this circuit represent? (Circle any/all that may apply and explain your response in the space provided below.) (3pts)

Low pass	High pass	Band pass	Notch
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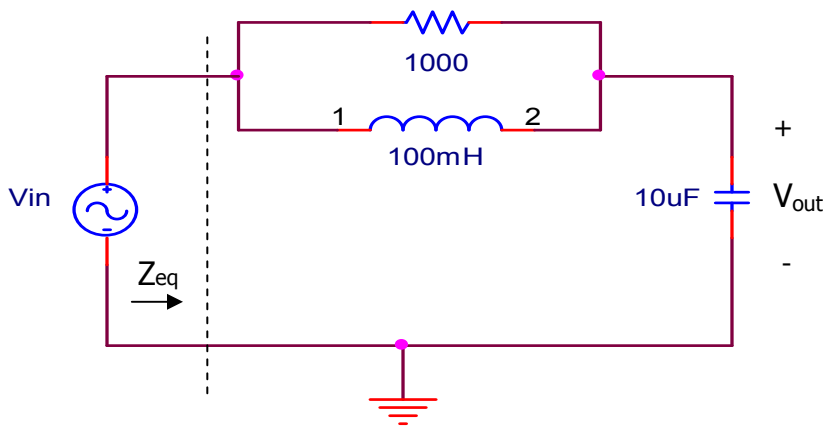
Problem 3 (cont)

c.) Find values for the components R, C and RF in the circuit below that would produce the frequency response shown above. (12pts)



RF	
C	
R	

Problem 4 (10pts)



a.) Find an expression for $Z_{eq}(s)$ shown in the above circuit. (6pts)

$Z_{eq}(s)$	
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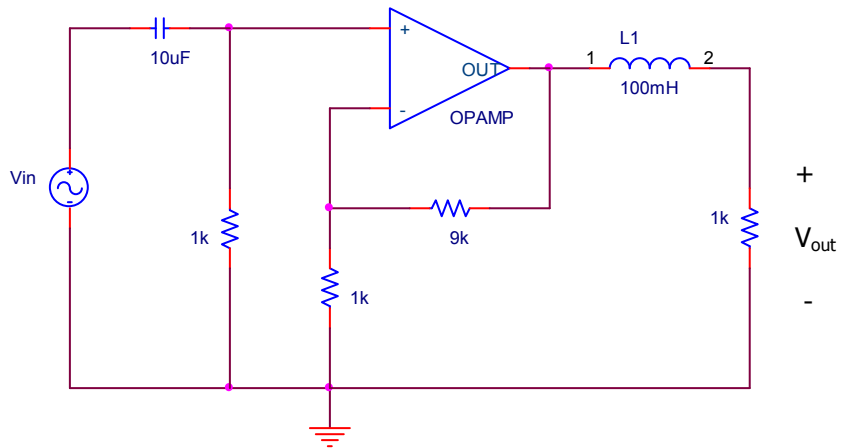
b.) What is $V_{out}(t)$ for $V_{in}(t) = 1\cos(\omega_0 t)$, where ω_0 is the resonant frequency? Please justify your response. (4pts)

$V_{out}(t)$	
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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.) Find the natural poles of the circuit. (5pts)

Poles	
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c.) What kind of response would this circuit produce? (Circle one and explain your response in the space provided below.) (5pts)

2 nd order LPF	2 nd order HPF	Resonant circuit	None of these
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d.) Could the same overall frequency response be produced with greater selectivity (for example, a higher Q)? Please justify your response in the space below to get credit (If yes, how? --- If not, why not?). (5pts)

Yes	No
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