Name _____ UW ID#: _____ Section: ___ Version A

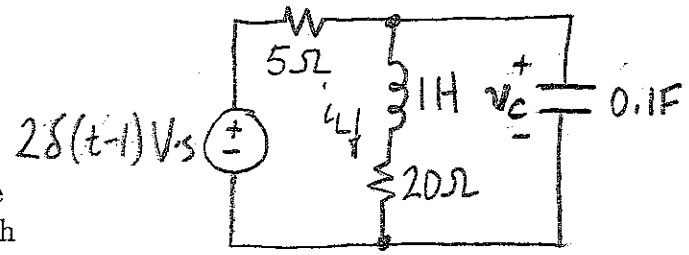
Final Exam — EE 233

Fall 2006

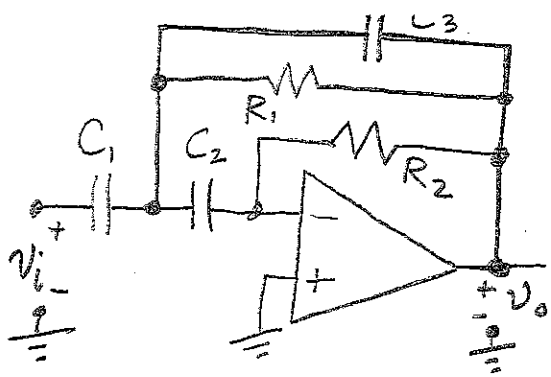
The test is closed book, with two sheets of 8.5 by 11 inch notes and standard (non-graphing) calculators allowed. Show all work. Be sure to state all assumptions made and **check** them when possible. The number of points per problem are indicated in parentheses. Total of 150 points in 6 problems on 6 pages. A table of Laplace transform pairs are attached as page 7.

1. In the circuit to the right, $v_C = 3\,\text{V}$ and $i_L = 0.1\,\text{A}$ at $t = 0^-$.

   Draw the s-domain circuit valid for $t > 0$ and determine $V_C(s)$. Check your result with the Initial Value Theorem. (25)



2. A filter is constructed using the circuit at the right. Find the transfer function $H(s)$ in terms of R_1, R_2, C_1, C_2, and C_3. What kind of filter is it? (25)



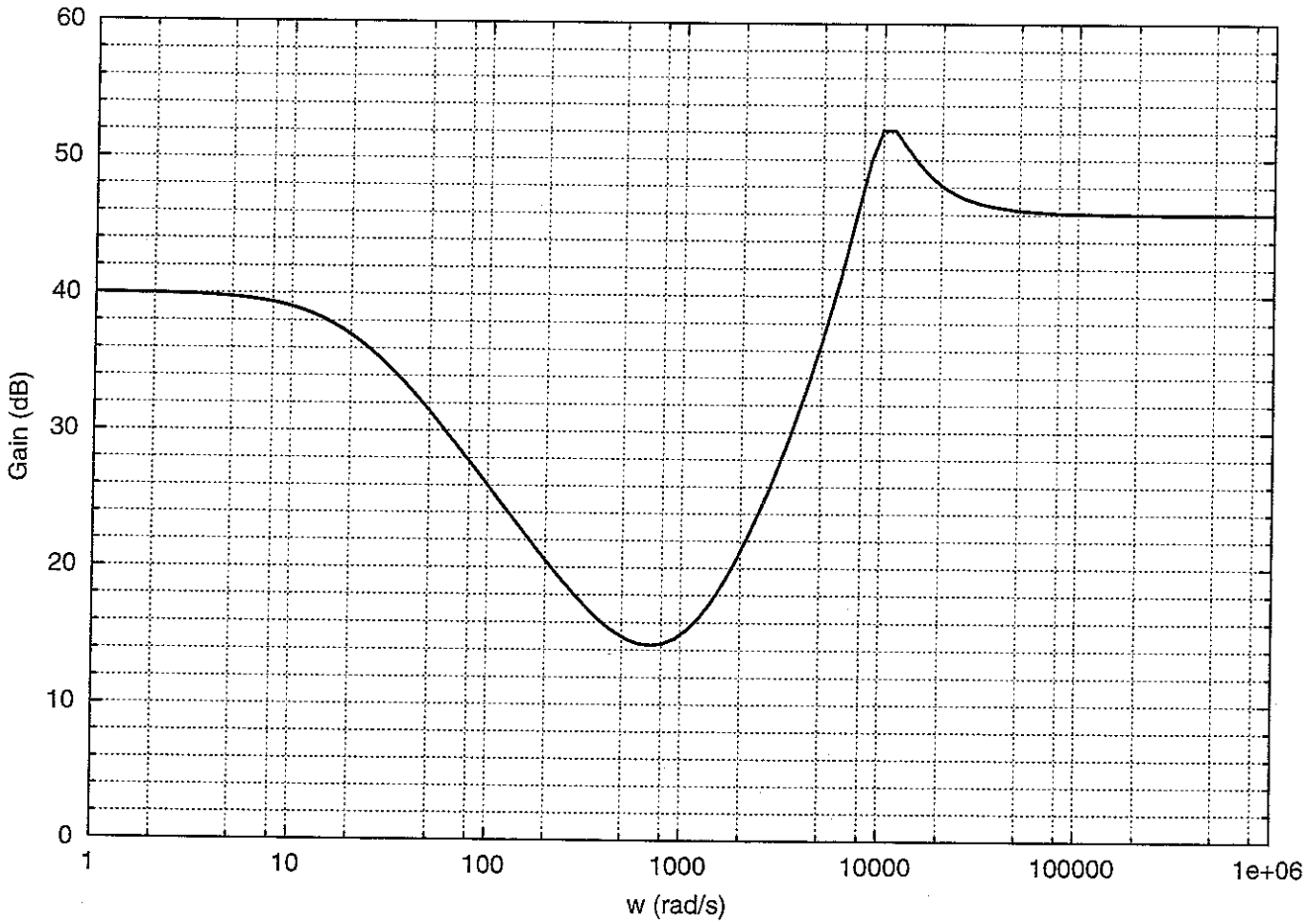
3. Design the s-domain transfer function for a low-pass filter with a corner frequency of 10^4 rad/s, a pass-band gain of 50, a gain at the corner frequency of 37 dB, and a gain less than 0.5 at 8×10^4 rad/s. (25)

4. Find the time-domain behavior of the following s-domain functions:

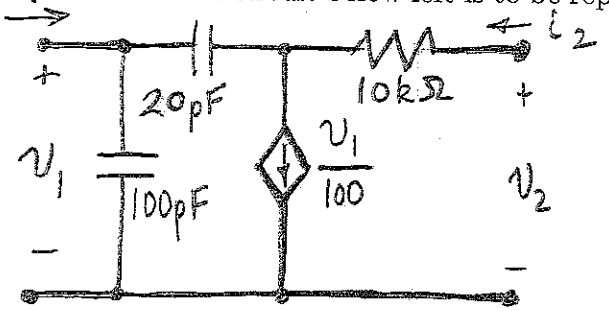
(a) $V_1(s) = \dfrac{2s+1}{s+3}$ (10)

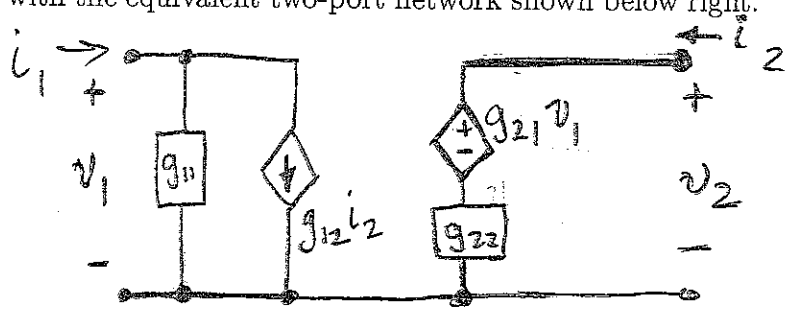
(b) $V_2(s) = \dfrac{10s+5}{s^2+9s+13}$. (15)

5. Determine the s-domain transfer function associated with Bode magnitude plot below. Show your work on the plot and in workspace. (25)



6. The circuit below left is to be replaced with the equivalent two-port network shown below right.





(a) Calculate the two-port parameters g_{12} and g_{22} in the frequency domain (as function of ω). (15)

(b) For $v_1(t) = 2\exp(-10^6 t)$V, calculate the complex power delivered to a load connected across v_2 consisting of a 10kΩ resistor in series with a 100pF capacitor. (10)

End Of Exam