

ECE 202 (Fall 2007)  
Homework No. 8  
Due: Friday, 11/2/2007

(P.1) [50 pts] With the additional instructions below, re-work **ALL** problems in Exam II (including those problems that you have received full credit). Note: Follow the instructions below to receive credit for your work.

Problem 1 (a, b): Use the time-shift property of Laplace transform to solve these problems.

Problem 2 (b): Convert  $G(s)$  into a *proper rational function* first before taking the inverse Laplace transform

Problem 3: Express your answer,  $f(t)$ , in the form  $f(t) = f_1(t) + f_2(t)$ , where  $f_1(t)$  is an exponential function, and  $f_2(t)$  is the product of an exponential and a trigonometric function.

Problem 5:

- i. Assume all initial conditions to be zero.
- ii. Use voltage division to obtain  $H_1(s)$  and  $H_2(s)$ .
- iii. Express the poles and zeros symbolically for parts 5(c) & 5(h).
- iv. Specify the transfer function type with respect to the corner frequency/frequencies (parts 5(f) & 5(j)).

(P.2) [8 pts] Solve Problem 12-22 in text.

(P.3) [24 pts] For the circuit in Figure 1

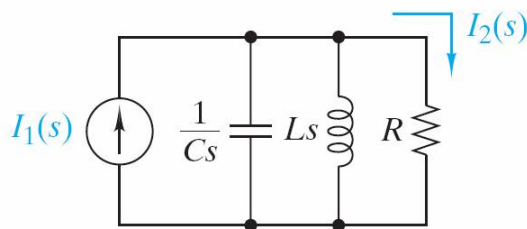


Figure 1 Circuit diagram for P.3

- (a) [3 pts] Derive the transfer function,  $H(s) = I_2(s)/I_1(s)$ . Express the denominator of  $H(s)$  as a polynomial with an unity coefficient for the highest order of  $s$ .
- (b) [10 pts] Let  $R = 500\Omega$ ,  $L = 50 \mu\text{H}$ , and  $C = 20 \text{ nF}$ . Find: the resonance frequency,  $\omega_0$ , lower corner frequency,  $\omega_{C1}$ , upper corner frequency,  $\omega_{C2}$ , bandwidth, BW, and the quality factor, Q.
- (c) [11 pts] With the values obtained from part (b), write a "netlist" file for the circuit and perform a PSPICE (NOT OrCAD capture) simulation to obtain the Bode plots for  $T(s)$ . Indicate the corner frequencies on the Bode plots. What type of a gain function is this? Submit your **netlist** file for credit. (You must create this file on your own from scratch).

(P.4) [8 pts] Solve Problem 12-24 in text.

(P.5) [10 pts] Determine the transfer function,  $H(s)$ , from the Bode magnitude plot shown in Figure 2. Express the denominator of  $H(s)$  as a polynomial with an unity coefficient for the highest order of  $s$ .

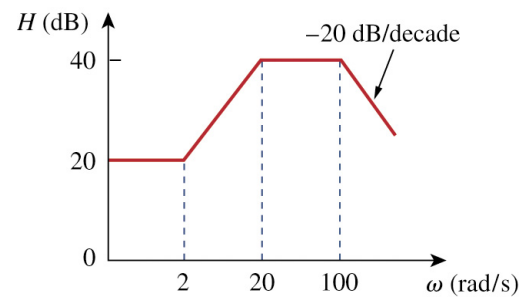


Figure 2 Waveform for Problem P.4