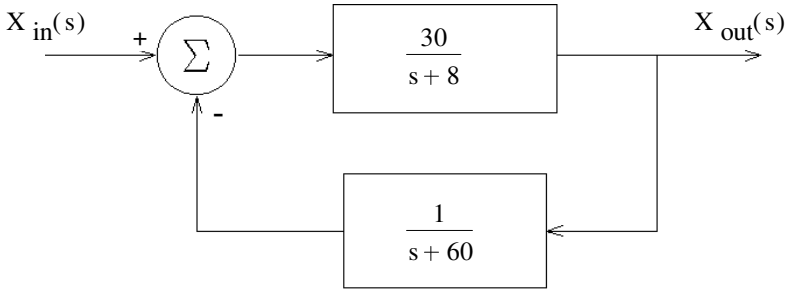
ECE 3510 homework # 4 Due: Thur, 1/26/06

1. For each feedback system shown below, find the transfer function of the whole system, with feedback.

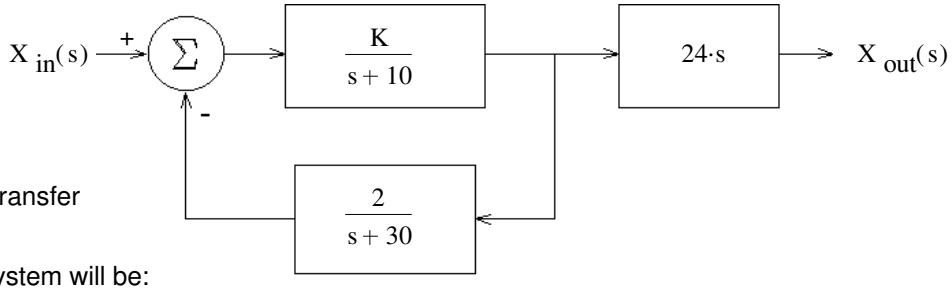
Find $H(s) = \frac{X_{out}(s)}{X_{in}(s)}$ For each Simplify your expression for H(s) so that he numerator and denominator are both simple polynomials

a)



b)

$H(s) = \frac{X_{out}(s)}{X_{in}(s)} = ?$



c) Find the value of K to make the transfer function critically damped.

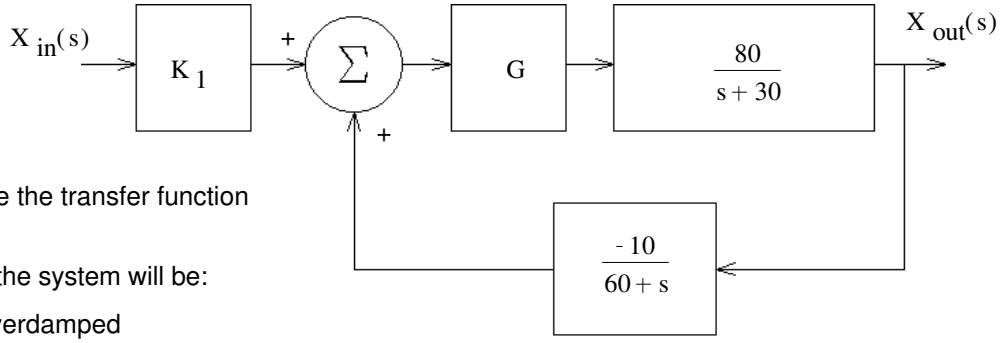
d) If K is more than this value the system will be:

underdamped or overdamped

e) Does the transfer function have a zero? If yes, what is it?

f)

$H(s) = \frac{X_{out}(s)}{X_{in}(s)} = ?$



g) Find the value of G to make the transfer function critically damped.

h) If G is **less** than this value the system will be:

underdamped or overdamped

i) Does the transfer function have a zero? If yes, what is it?

2. Problem 3.2b, p.50 in text

3. Problem 3.3, p.50 in text As part of your work to reach a solution, draw the pole diagram for each.

Answers

1. a) $\frac{30 \cdot s + 1800}{s^2 + 68 \cdot s + 5100}$ b) $\frac{K \cdot 24 \cdot s \cdot (s + 30)}{s^2 + 40 \cdot s + 300 + 2 \cdot K}$ c) 50 d) underdamped e) 0, - 30

f) $K_1 \cdot \frac{G \cdot 80 \cdot s + G \cdot 4800}{s^2 + 90 \cdot s + 800 \cdot G + 1800}$ g) 0.28125

h) overdamped i) - 60

2. $\frac{H_1 \cdot H_4 + H_2 \cdot H_4 - H_1 \cdot H_2 \cdot H_3 + H_1 \cdot H_3}{1 + H_1}$

3.

	Stable	Problem input
a)	yes	
b)	no	cos(2·t)
c)	yes	
d)	no	1
e)	no	1
f)	no	1