ECE 321 - Homework #4

Filters. Project part (b). Due Monday, November 26th, 2018

Filters:

Problem 1) Assume x(t) and y(t) are related by the following transfer function:

$$Y = \left(\frac{10}{(s+2)(s+3)} \right) X$$

Find y(t) assuming

$$x(t) = 2 + 3\cos(4t)$$

Problem 2) Assume x(t) and y(t) are related by the following transfer function:

$$Y = \left(\frac{5s+2}{s^2+5s+300} \right) X$$

2a) Plot the gain from X to Y vs. frequency from 0 rad/sec to 30 rad/sec.

2b) Find the frequency, w, which results in the gain being a maximum (resonance):

$$x(t) = 2\cos(\omega t)$$

Find y(t) for this x(t).

Project (part b):

Problem 3) Specify the requirements for the sensor

- Input (light, sound, range)
- Output (voltage, current)
- Relationship

Problem 4) Design a circuit to meet these requirements. Use a LM833 Op-Amp for your amplfiers. Calculate the voltages you should see

- At the endpoints
- One or two points in between

Problem 5) Simulate your circuit to verify it operates correctly. Check the voltages at

- At the endpoints
- One or two points in between

to see if they match your computations.

Problem 6) Build your circuit in lab and verify it operates correctly. Check the voltages at

- At the endpoints
- One or two points in between

to see if they match your computations and simulation results.

Problem 7) Demo. Demonstrate your amplfier with the power amp from homework #1 (video or in person).