

ECE 321 - Homework #3

Active Filters. Due Wednesday, April 20th

Please make the subject "ECE 321 HW#3" if submitting homework electronically to Jacob_Glower@yahoo.com (or on blackboard)

Filters

1) Assume X and Y are related by the following transfer function:

$$Y = \left(\frac{40}{(s+2)(s+7)} \right) X$$

- What is the differential equation relating x and y?
- Determine y(t) assuming

$$x(t) = 4 + 5 \cos(7t) + 6 \sin(7t)$$

Filter Design

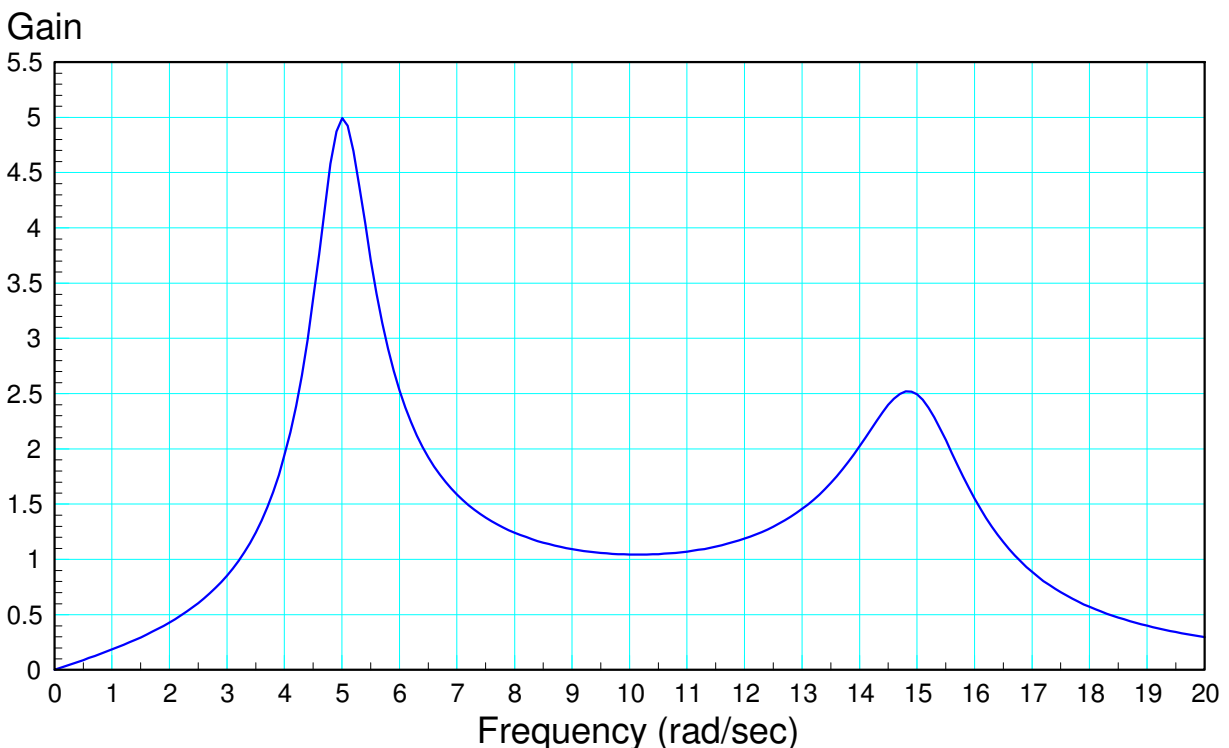
2) Give an op-amp circuit to implement the following filter

$$Y = \left(\frac{500}{(s+2)(s+6)(s+12)} \right) X$$

3) Give an op-amp circuit to implement the following filter

$$Y = \left(\frac{500}{(s^2+2s+10)(s^2+4s+20)} \right) X$$

4) Give the transfer function of a filter with the following gain vs. frequency



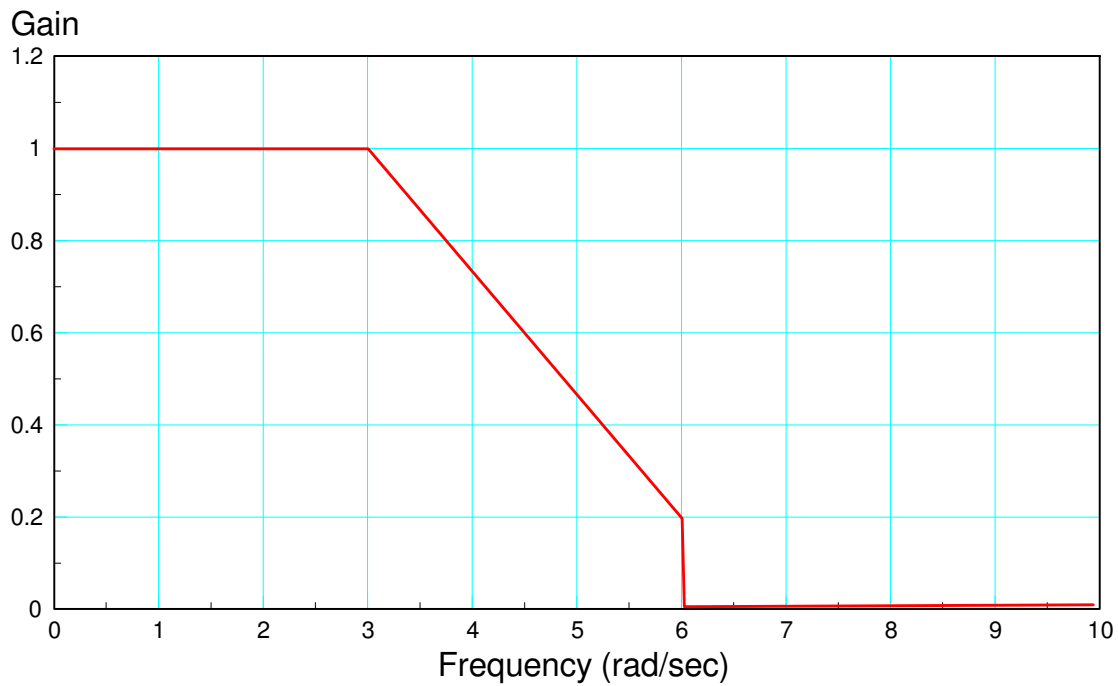
Filter Design using *fminsearch()*

5) Design a filter of the form

$$Y = \left(\frac{ace}{(s+a)(s^2+bs+c)(s^2+ds+e)} \right) X$$

to give a gain vs. frequency as close to the following plot as possible over the range of (0, 10) rad/sec.

Plot your filter's actual frequency response vs. it's ideal response (red line).



6) Design circuit to implement the filter you designed in problem #5

7) Check your filter using CircuitLab