ECE 321 - Homework #2

Filters. Due Monday April 3, 2017

Problem 1) DC Block: For the following filter:

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

a) Determine the differential equation relating X and Y

b) Determine y(t) assuming

$$x(t) = 2 + 3\sin(10t) + 4\sin(100t)$$

c) Design an op-amp circuit to implement this filter.

Problem 2) Low Pass Filter with Real Poles: For the following filter:

$$Y = \left(\frac{400}{(s+10)(s+20)}\right)X$$

a) Determine the differential equation relating X and Y

b) Determine y(t) assuming

$$x(t) = 2 + 3\sin(10t) + 4\sin(100t)$$

c) Design an op-amp circuit to implement this filter.

Problem 3) Low Pass Filter with Complex Poles: For the following filter:

$$Y = \left(\frac{225}{s^2+15s+225}\right)X$$

a) Determine the differential equation relating X and Y

b) Determine y(t) assuming

$$x(t) = 2 + 3\sin(10t) + 4\sin(100t)$$

c) Design an op-amp circuit to implement this filter.

Problem 4) Band Pass Filter: For the following filter:

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

a) Determine the differential equation relating X and Y

b) Determine y(t) assuming

$$x(t) = 2 + 3\sin(10t) + 4\sin(100t)$$

c) Design an op-amp circuit to implement this filter.