

# Homework #4: ECE 461

LaPlace Transforms, 1st and 2nd Order Approximations, Block Diagrams. Due Monday, September 25th

## LaPlace Transforms

1) A system has the following transfer function

$$Y = \left( \frac{10(s+3)}{(s+1)(s+4)(s+10)} \right) X$$

1a) What is the differential equation which relates X and Y?

1b) Determine  $y(t)$  assuming

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

1c) Determine  $y(t)$  assuming

$$x(t) = \begin{cases} 0 & t < 0 \\ 2 & t > 0 \end{cases}$$

2a) Determine a 2nd-order system which has approximately the same step response as this system

$$Y = \left( \frac{100,000}{(s+2)(s+8)(s+20)(s+50)} \right) X$$

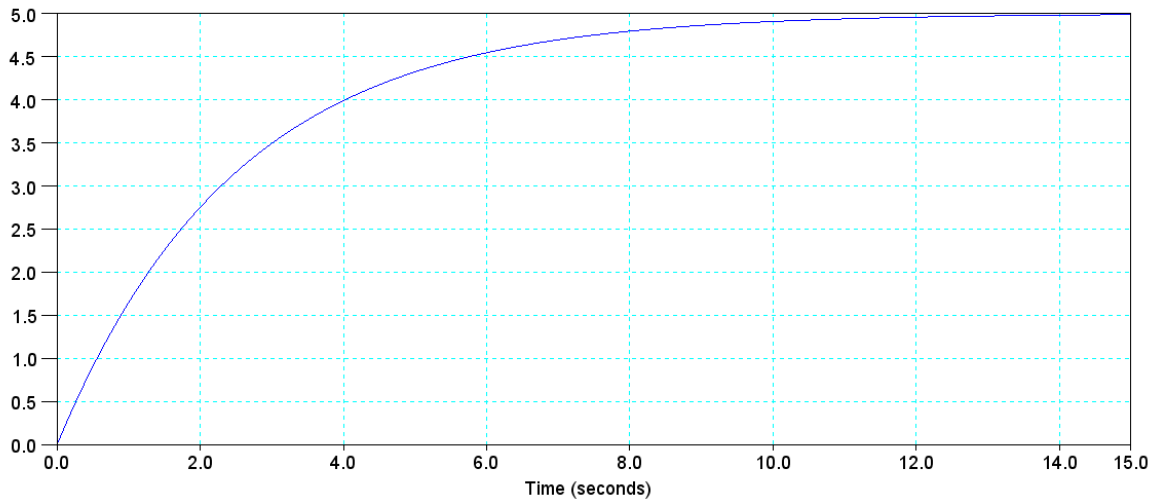
2b) Compare the step response of the two systems in Matlab (or similar program)

3a) Determine a 2nd-order system which has approximately the same step response as this system

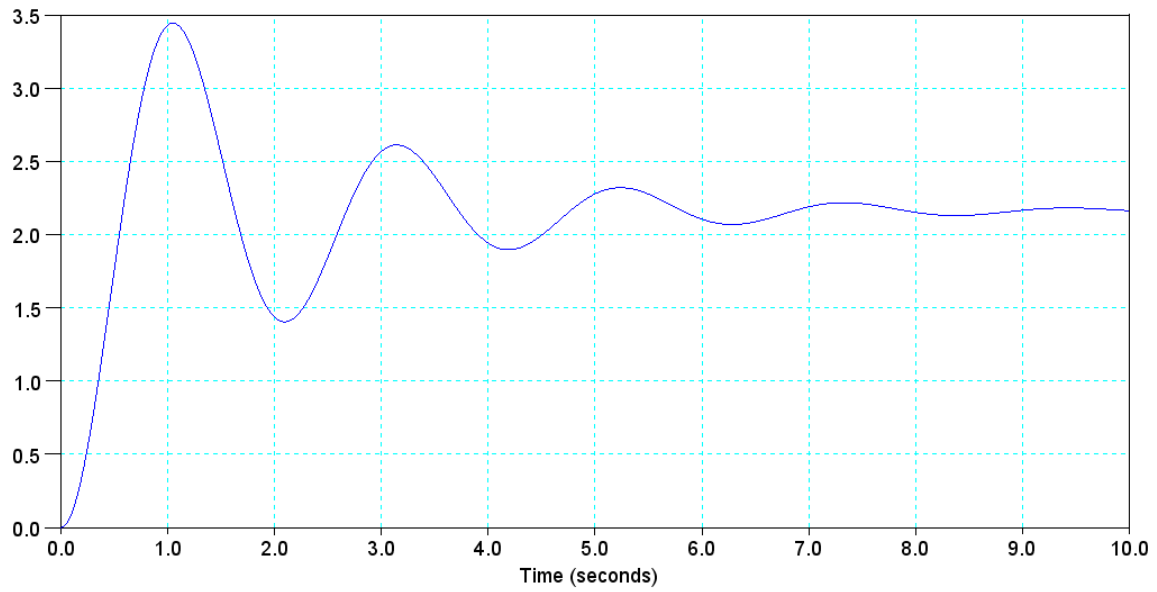
$$Y = \left( \frac{100,000}{(s^2+2s+16)(s+20)(s+50)} \right) X$$

3b) Compare the step response of the two systems in Matlab (or similar program)

4) Find the transfer function for a system with the following step response:

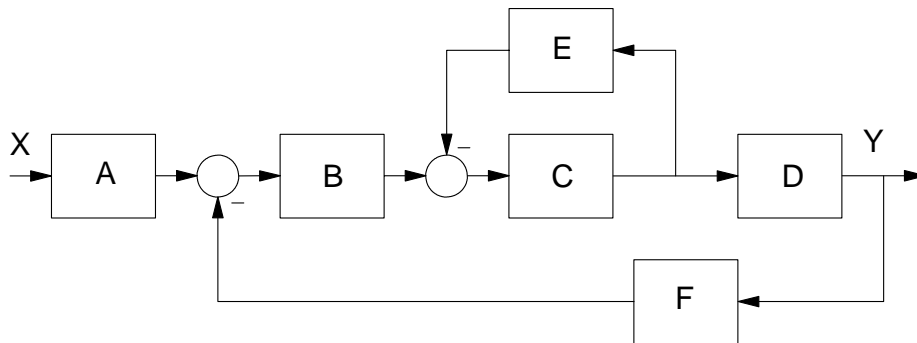


5) Find the transfer function for a system with the following step response:



### Block Diagrams

6) Find the transfer function from X to Y



7) Find the transfer function from X to Y

