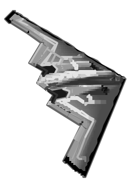
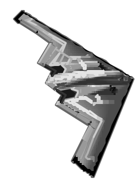
OKLAHOMA STATE UNIVERSITY

SCHOOL OF ELECTRICAL AND COMPUTER ENGINEERING



ECEN 3723 Systems I
Fall 2000
Midterm Exam #2



" choose any 2 from Problems 1, 2, and 5,
in addition to Problems 3 and 4"

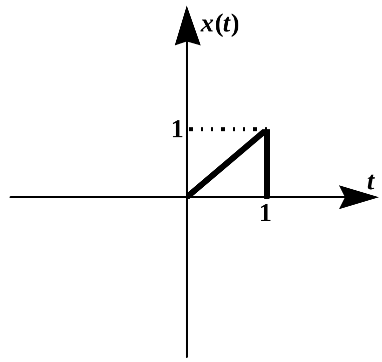
Name : ______________________________

Student ID: ________________________________

E-Mail Address:_______________________________________

Problem 1:

Consider a filtered circuit that the output response, $y(t)$, is the time-convolution of the input signal, $x(t)$, graphically shown below, and the impulse response, $h(t)$, where $h(t) = e^{-5t}u(t)$, please find $y(t)$.



<u>Problem 2</u>:

Show

$$\mathbf{Z}\left[\operatorname{Im} x(k)\right] = \frac{1}{2}\left(X(z) - X^{*}(z^{*})\right)$$

where ‘*” denotes complex conjugate operation.

Problem 3:

Find $X(z)$ for

a) $x(k) = k^3 u(k)$

b) $x(k) = \left(\frac{1}{2}\right)^k u(-k-2)$

Problem 4:

Find $x(k)$ for

a) $X(z) = \dfrac{1}{z^2 + 1}$

b) $X(z) = \ln\left(\dfrac{z-1}{2z}\right)$

<u>Problem 5</u>:

A linear time-invariant discrete-time system is given by the input-output difference equation

$$y(k) + y(k-1) - 2y(k-2) = x(k) - 2x(k-1) + x(k-2).$$

Find an input $x(k)$ with $x(k) = 0, k < 0$ that gives the output response $y(k) = 2u(k) - u(k-2)$ with initial condition $y[-2] = 2,\ y[-1] = 1$.