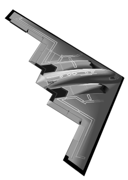
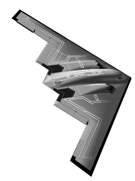
OKLAHOMA STATE UNIVERSITY

SCHOOL OF ELECTRICAL AND COMPUTER ENGINEERING



# ECEN 3723 Systems I
# Fall 2001
# Midterm Exam #1



**<u>Graduate Students</u>: DO ALL FIVE PROBLEMS**

**<u>Others</u>: CHOOSE ANY FOUR OUT OF FIVE INDICATED BELOW**
**(1)_____, (2)_____, (3)_____, (4)_____, (5)_____.**

**Name : ______________________________**

**Student ID: ________________________________**

**E-Mail Address:_______________________________________**

**Problem 1**:
a) Evaluate the following integral involving delta function:

$$\int_{-\infty}^{\infty} e^{jw\frac{t}{2}}\delta(2t-3)dt$$

b) Find the Laplace transform of

$$\sin(t+2)e^{-2t}u(t-1)$$

**Problem 2**:

Given the initial value theorem

$$x(0) = \lim_{s \to \infty} sX(s) \,,$$

we have shown in the Homework #3, Problem 6,

$$\dot{x}(0) = \left. \frac{dx(t)}{dt} \right|_{t=0} = \lim_{s \to \infty} \left[ s^2 X(s) - sx(0) \right].$$

Please derive the result for $\ddot{x}(0) = \left. \frac{d^2 x(t)}{dt^2} \right|_{t=0}$ in a similar spirit.

**Problem 3**:

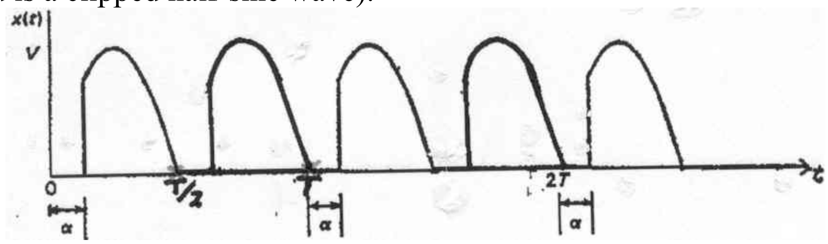
A continuous-time signal $x(t)$ has the Laplace transform

$$X(s) = \frac{2s+5}{3s^2+3s+1},$$

determine the Laplace transform $V(s)$ for

$$v(t) = x(t)\sin(2t+3).$$

**Problem 4**:
Determine the Laplace transform of the following signal, $x(t)$, with five periods shown below (i.e., each period is a clipped half-sine wave).



**Problem 5**:

Solving the linear time-invariant ordinary differential equation

$$\frac{d^2y(t)}{dt^2} + 4\frac{dy(t)}{dt} + 13y(t) = -5\frac{dx(t)}{dt} + 6x(t),$$

with initial conditions $y(0) = 3, \left.\frac{dy(t)}{dt}\right|_{t=0} = -2$ and input $x(t) = e^{-4t}u(t)$ where $y(t)$ is the output response and $x(t)$ is the input signal. Find $y(t)$ and $y(0)$.