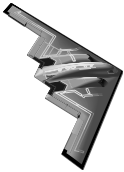
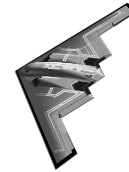


OKLAHOMA STATE UNIVERSITY

SCHOOL OF ELECTRICAL AND COMPUTER ENGINEERING



**ECEN 3723 Systems I**  
**Fall 2010**  
**Midterm Exam 1**  
**October 19, 2010**



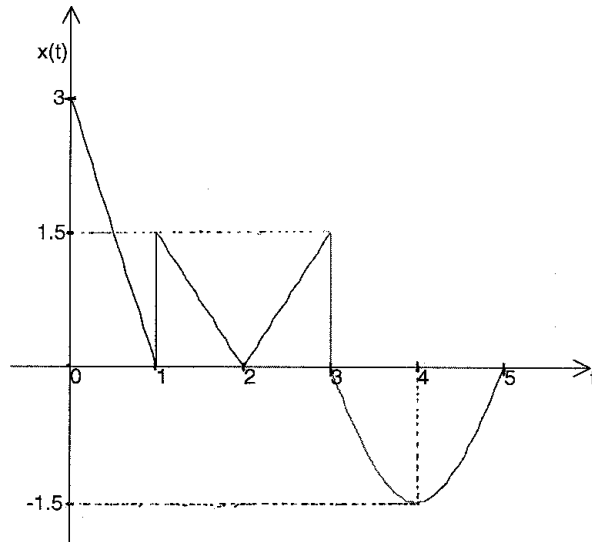
**Choose any four out of five problems.**  
*Please specify which four listed below to be graded:*  
1)\_\_\_\_; 2)\_\_\_\_; 3)\_\_\_\_; 4)\_\_\_\_;

**Name :** \_\_\_\_\_

**E-Mail Address:** \_\_\_\_\_

**Problem 1:**

Describe the following signal,  $x(t)$ , in terms of some basis functions (e.g., step, impulse, ramp or sinusoidal):



**Problem 2:**

a) Find the Laplace transform of

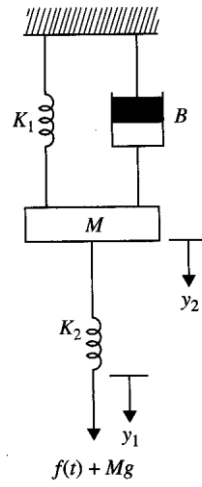
$$\frac{d}{dt}(\cos(\omega t + \theta))$$

and b) Find the Inverse Laplace transforms of

$$s \ln \frac{s+a}{s+b}.$$

**Problem 3:**

Write the equation of motion for the linear translational system shown below (DO NOT SOLVE)



**Problem 4:**

Given a system described by the transfer function

$$H(s) = \frac{Y(s)}{X(s)} = \frac{2s + 3}{s^2 + 4s + 13}$$

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

**Problem 5:**

Obtain an analogous mechanical system (using force-voltage analogy) for the electrical system shown below.

