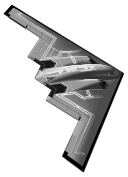
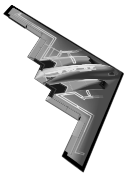
O K L A H O M A S T A T E U N I V E R S I T Y

SCHOOL OF ELECTRICAL AND COMPUTER ENGINEERING



ECEN 3723 Systems I
Fall 2001
Midterm Exam #2



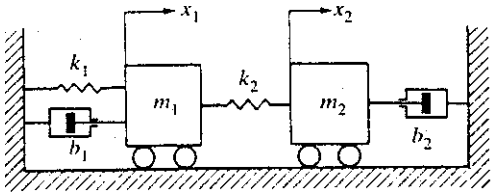
Choose any four out of five problems,
Please specify
1)_____; 2)_____; 3)_____; 4)_____;

Name : _____

Student ID: _____

E-Mail Address:_____

Problem 1:
Obtain an *analogous* electrical circuits (using force-voltage analogy) for the mechanical system shown below.



Problem 2:

Find $X(z)$, the z-transform of

$$x(k) = k(0.25)^{-k}u(k-2).$$

Problem 3:

Find $x(k)$, the inverse z-transform of

$$X(z) = \ln\left(\frac{2z-1}{2z}\right).$$

Problem 4:
The input $x(k) = u(k) - 2u(k-2) + u(k-4)$ is applied to a linear time-invariant discrete-time system. The resulting response with *no initial* energy is $y(k) = ku(k) - ku(k-4)$. Determine the transfer function $H(z)$ of the system.

Problem 5:

A linear, time-invariant discrete-time system is described by the transfer function

$$H(z) = \frac{3z}{z^2 - 0.25}.$$

The output response resulting from the input $x(k) = u(k)$ and initial conditions $y[-1]$ and $y[-2]$ is

$$y(k) = \left[(0.5)^k - 3(-0.5)^k + 4\right]u(k).$$

Determine the initial conditions $y[-1]$ and $y[-2]$.