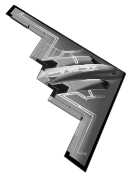
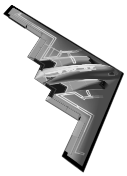
O K L A H O M A S T A T E U N I V E R S I T Y

SCHOOL OF ELECTRICAL AND COMPUTER ENGINEERING



ECEN 3723 Systems I
Spring 2002
Midterm Exam #2



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

Name : _____

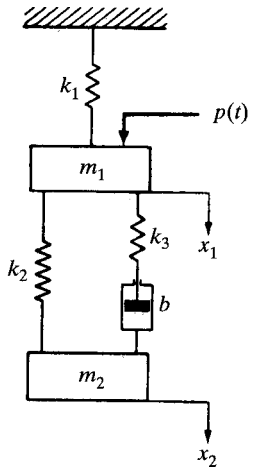
Student ID: _____

E-Mail Address:_____

Problem 1:

Consider the mechanical system shown below where $p(t)$ is the external force input to the system. Using the force-voltage analogy to derive an *analogous* electrical system. Show the resulting circuit diagram.

(Hint: define the displacement of midpoint between k_3 and b as x_3.)



Problem 2:

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

a) $x(k) = k(k-1)(0.25)^{-k}u(k-2)$, and

b) $\lim_{k\to\infty}\left[\sum_{i=0}^{k} x(i)\right]$.

Problem 3:

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

a) $X(z) = \ln(z + a) - \ln(z - b)$, and

b) $X(z) = \dfrac{(1 - e^{-1})z^{-1}}{(1 - z^{-1})(1 - e^{-1}z^{-1})}$.

Problem 4:

Solve the following difference equation

$$(k+1)x(k+1) - kx(k) = k+1$$

wkere $x(k) = 0$ for $k \le 0$.

Problem 5:

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

$$H(z) = \frac{z^2 - 2z + 1}{z^2 + z - 2}.$$

Find an input $x(k)$ with $x(k) = 0, k < 0$ that gives the output response $y(k) = 2u(k) - u(k-2)$.