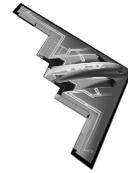


OKLAHOMA STATE UNIVERSITY
SCHOOL OF ELECTRICAL AND COMPUTER ENGINEERING



ECEN 3723 Systems I
Fall 2002
Midterm Exam #2



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

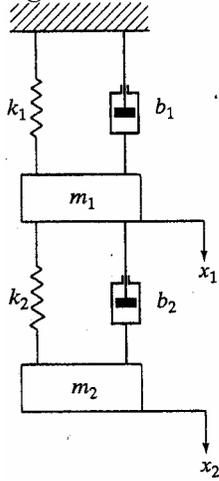
Name : _____

Student ID: _____

E-Mail Address: _____

Problem 1:

Consider the mechanical system shown below. Using the force-current analogy to derive an *analogous* electrical circuit. Show the resulting circuit diagram.



Problem 2:

- a) Derive the formula for k^3 -multiplication, in a similar spirit as we did for k/k^2 -multiplication.
- b) Find $X(z)$, the z-transform of $\sum_{i=0}^k ia^i$

Problem 3:

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

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

b) $X(z) = \frac{1-az^{-1}}{z^{-1}-a}$.

Problem 4:

Given z transform of $k^5 3^k u(k)$ is $X(z)$, find the $y(k)$, such that

a) $Y(z) = X(2z)$

b) $Y(z) = \frac{d}{dz} X(z)$

Problem 5:

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

$$h(k) = 3\left(\frac{1}{4}\right)^k u(k-1).$$

Find the output response $y(k)$ with $y(k) = 0, k < 0$ for a given input function $x(k) = 2u(k)$.

Please note the z transform of the impulse response function of a linear, time-invariant system is its transfer function.