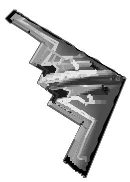
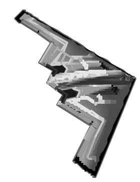
OKLAHOMA STATE UNIVERSITY

SCHOOL OF ELECTRICAL AND COMPUTER ENGINEERING



ECEN 3723 Systems I
Spring 2001
Midterm Exam #2



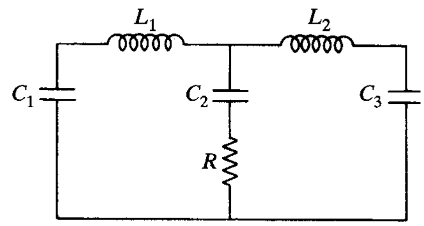
“ do Problems 3 and 4,
then choose any 2 from Problems 1, 2, and 5.
specify which two were chosen here: &   ”

Name : ______________________________

Student ID: ________________________________

E-Mail Address:_______________________________________

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



Problem 2:

The autocorrelation sequence of $x(k)$ is defined as

$$\phi_{xx}(k) = \sum_{n=-\infty}^{\infty} x(n)x(k+n) .$$

Determine the $\mathbb{Z}$ -transform of $\phi_{xx}(k)$ in terms of the $\mathbb{Z}$-transfrom of $x(k)$.

Problem 3:

Find $X(z)$ for

a) $x(k) = k^4 u(k)$

b) $x(k) = \left(\frac{1}{5}\right)^{-k} u(-k-2)$

Problem 4:

Find $x(k)$ for

a) $X(z) = \dfrac{z^{-1}}{(e - z^{-1})^3}$

b) $X(z) = \ln\left(\dfrac{z-1}{2z^2+1}\right)$

Problem 5:

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

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

Find an input $x(k)$ with $x(k)=0, k<0$ that gives the output response $y(k)=2u(k)-u(k-2)$ with initial condition $y[-2]=2,\ y[-1]=1$.