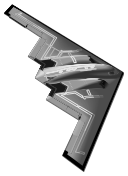
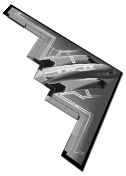
O K L A H O M A S T A T E U N I V E R S I T Y

SCHOOL OF ELECTRICAL AND COMPUTER ENGINEERING



ECEN 3723 Systems Dynamics
Fall 2012
Final Exam
December 13, 2012



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

Name : _____

E-Mail Address:_____

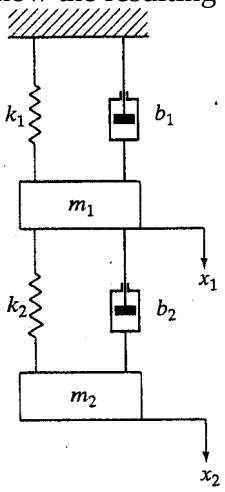
Problem 1: A continuous-time signal $x(t)$ has the Laplace transform

$$X(s) = \frac{s+1}{s^3 + 3s^2 - 5s - 7},$$

determine the Laplace transform $V(s)$ for

$v(t) = x(t)\cos 5t$.

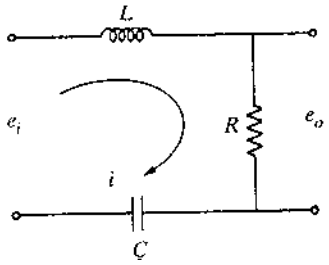
Problem 2: Consider the mechanical system shown below. Using the force-current analogy to derive an *analogous* electrical circuit. Show the resulting circuit diagram.



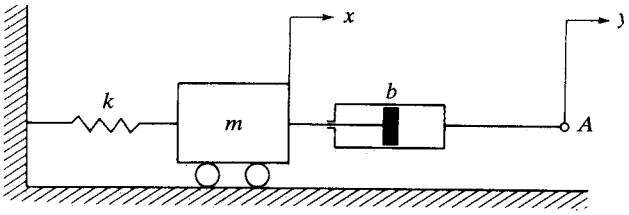
Problem 3: Consider the electrical circuits shown below. Assume that the input is sinusoidal,

$e_i(t) = E_i \cos \omega t$,

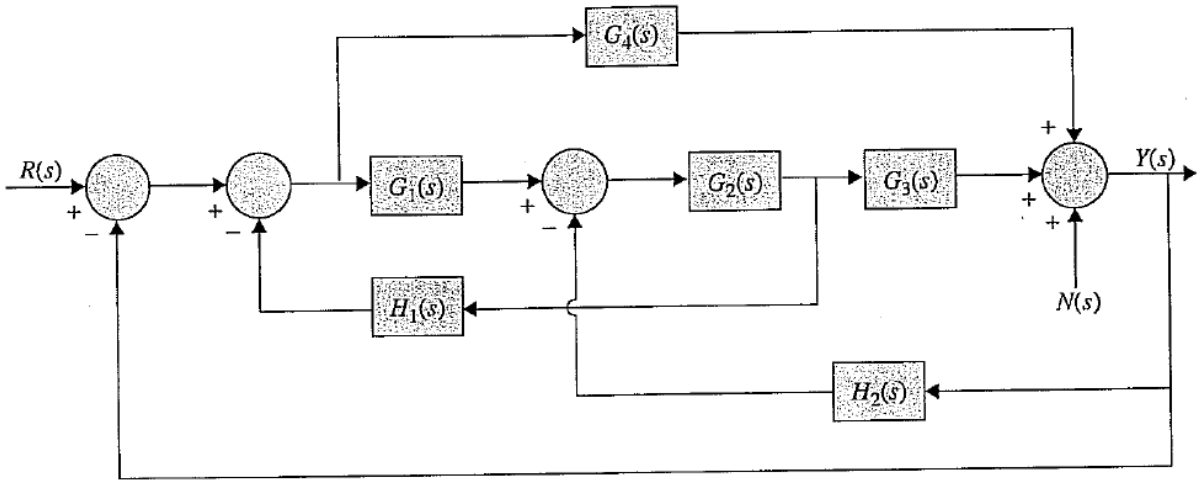
what is the steady state current $i(t)$?



Problem 4: The mechanical system shown below is at rest initially. At $t = 0$, a unit-step displacement input is applied to point *A* (i.e., $y(t) = u(t)$). Assuming that the system remains linear throughout the response period and is *underdamped*, determine the response $x(t)$ as well as the values of $x(0+)$, $\dot{x}(0+)$ and $x(\infty)$.



Problem 5: The block diagram of a feedback control system is shown below:



Use the block diagram reduction technique to find the transfer functions $\left.\frac{Y(s)}{R(s)}\right|_{N(s)=0}$ and $\left.\frac{Y(s)}{N(s)}\right|_{R(s)=0}$.