Problem Set #2
DUE Thursday, February 21, 2002

Problem 1
Using the Laplace Transform, obtain the time response for each of the following systems subject to the input and initial conditions specified below:

a)

$$\frac{d^3y}{dt^3} + 3\frac{d^2y}{dt^2} + 2\frac{dy}{dt} = 2\frac{du}{dt} + 3u$$

$$u = \begin{cases} 1 & t > 0 \\ 0 & t \le 0 \end{cases}$$

$$y(0) = 1 \qquad \dot{y}(0) = -1 \qquad \ddot{y}(0) = 2$$

b)

$$\frac{d^2y}{dt^2} + 2\frac{dy}{dt} + 10y = -3\frac{du}{dt} + u$$

$$u = \begin{cases} t^2 & t > 0 \\ 0 & t \le 0 \end{cases}$$

$$y(0) = \dot{y}(0) = 0$$

Problem 2
Nise Problem 2-27

Problem 3
Nise Problem 2-46: Solve the problem as shown in the book. The following diagram is aimed at clarifying the parameters specified for the motor.

$R_a = 1\ \Omega$

$e_a(t)$

$J_a = 1\ \text{Kg m}^2$

$D_a = 1\ \text{Nms/rad}$

$K_t = 1\ \text{Nm/A}$
$K_b = 1\ \text{Vs/rad}$