**SYSTEM CONTROL**                                                                                          **Fall 2014**

HW#1  **Laplace Transform**                                          **Out: September 11, 2014 (Th)**
                                                                                           **Due: September 18, 2014 (Th)**

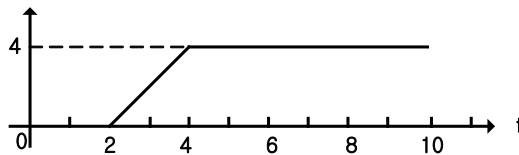[1]  Compute Laplace Transform

(1) unit step $1(t)$
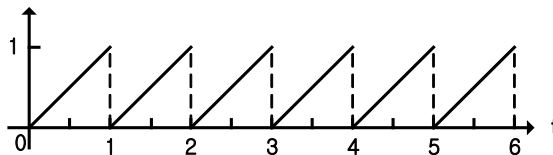
(2) $\sin \omega t$

(3) $\dfrac{1}{a}(1 - e^{-at})$

(4) $e^{-at}\cos \omega t$

[2] Find the Laplace transforms of

(1)   f(t)



(2)  f(t) =



[3]  Obtain the inverse Laplace transform of followings:

(1) $\dfrac{1}{s+a}$     (2) $\dfrac{1}{(s+a)^2}$     (3) $\dfrac{1}{s^2 - \omega^2}$     (4) $F(S) = \dfrac{1}{(S+2)^2(S+3)}$ .

[4]  Show that

$$L\left\{\dfrac{d}{dt}f(t)\right\} = sF(s) - f(0)$$

where $F(s) = L\{f(t)\}$

[5]  Show that:

$$\lim_{t \to 0} f(t) = \lim_{s \to \infty} sF(s)$$

[6]  Solve following differential equation by Laplace transformation.
$$\ddot{y} + 2\dot{y} + 4y = 1$$
$$y(0) = 0, \ \dot{y}(0) = 2$$