

# EE576 homework for Laplace Transform

6.27(a)-(c), 6.29(b)-(f), 6.31(a),(d)-(e), 6.32, 6.35, 6.36(a)&(c), 6.37 (d)(e)(h)(i)

6.27 Determine the bilateral Laplace transform and ROC for the following signals:

(a)  $x(t) = e^{-t}u(t+2)$

(b)  $x(t) = u(-t+3)$

(c)  $x(t) = \delta(t+1)$

(d)  $x(t) = \sin(t)u(t)$

6.29 Use the basic Laplace transforms and the Laplace transform properties given in Tables D.1 and D.2 to determine the unilateral Laplace transform of the following signals:

(a)  $x(t) = \frac{d}{dt}\{te^{-t}u(t)\}$

(b)  $x(t) = tu(t) * \cos(2\pi t)u(t)$

(c)  $x(t) = t^3u(t)$

(d)  $x(t) = u(t-1) * e^{-2t}u(t-1)$

(e)  $x(t) = \int_0^t e^{-3\tau} \cos(2\tau) d\tau$

(f)  $x(t) = t \frac{d}{dt}(e^{-t} \cos(t)u(t))$

6.31 Given the transform pair  $\cos(2t)u(t) \xleftrightarrow{\mathcal{L}_u} X(s)$ , determine the time signals corresponding to the following Laplace transforms:

(a)  $(s+1)X(s)$

(b)  $X(3s)$

(c)  $X(s+2)$

(d)  $s^{-2}X(s)$

(e)  $\frac{d}{ds}(e^{-3s}X(s))$

6.32 Given the transform pair  $x(t) \xleftrightarrow{\mathcal{L}_u} \frac{2s}{s^2+2}$ , where  $x(t) = 0$  for  $t < 0$ , determine the Laplace transform of the following time signals:

(a)  $x(3t)$

(b)  $x(t-2)$

(c)  $x(t) * \frac{d}{dt}x(t)$

(d)  $e^{-t}x(t)$

(e)  $2tx(t)$

(f)  $\int_0^t x(3\tau) d\tau$

6.35 Determine the initial value  $x(0^+)$ , given the following Laplace transforms  $X(s)$ :

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

$$(b) X(s) = \frac{s + 2}{s^2 + 2s - 3}$$

$$(c) X(s) = e^{-2s} \frac{6s^2 + s}{s^2 + 2s - 2}$$

6.36 Determine the final value  $x(\infty)$ , given the following Laplace transforms  $X(s)$ :

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

$$(b) X(s) = \frac{s + 2}{s^3 + 2s^2 + s}$$

$$(c) X(s) = e^{-3s} \frac{2s^2 + 1}{s(s + 2)^2}$$

6.37 Use the method of partial fractions to find the time signals corresponding to the following unilateral Laplace transforms:

$$(a) X(s) = \frac{s + 3}{s^2 + 3s + 2}$$

$$(b) X(s) = \frac{2s^2 + 10s + 11}{s^2 + 5s + 6}$$

$$(c) X(s) = \frac{2s - 1}{s^2 + 2s + 1}$$

$$(d) X(s) = \frac{5s + 4}{s^3 + 3s^2 + 2s}$$

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

$$(f) X(s) = \frac{3s + 2}{s^2 + 2s + 10}$$

$$(g) X(s) = \frac{4s^2 + 8s + 10}{(s + 2)(s^2 + 2s + 5)}$$

$$(h) X(s) = \frac{3s^2 + 10s + 10}{(s + 2)(s^2 + 6s + 10)}$$

$$(i) X(s) = \frac{2s^2 + 11s + 16 + e^{-2s}}{s^2 + 5s + 6}$$