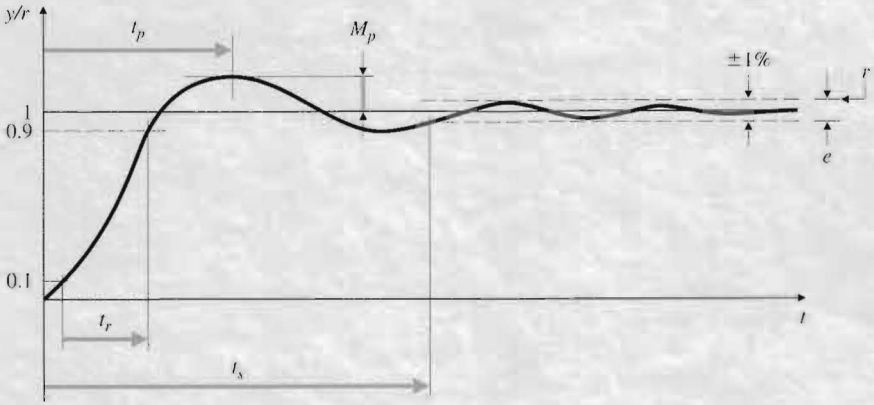
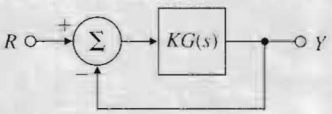
Table of Laplace Transforms

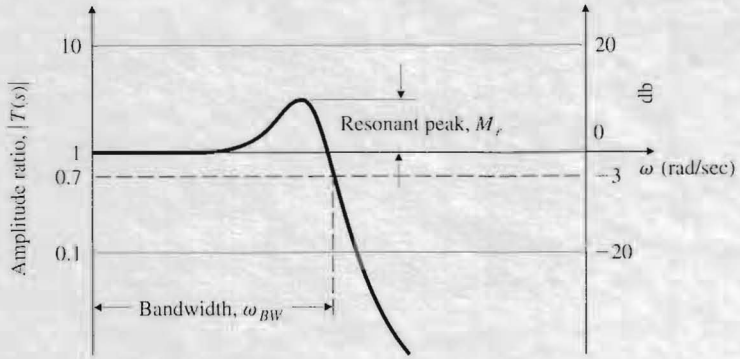
Number	$F(s)$	$f(t), t \geq 0$
1	1	$\delta(t)$
2	$\frac{1}{s}$	$1(t)$
3	$\frac{1}{s^2}$	t
4	$\frac{2!}{s^3}$	t^2
5	$\frac{3!}{s^4}$	t^3
6	$\frac{m!}{s^{m+1}}$	t^m
7	$\frac{1}{(s+a)}$	e^{-at}
8	$\frac{1}{(s+a)^2}$	te^{-at}
9	$\frac{1}{(s+a)^3}$	$\frac{1}{2!}t^2e^{-at}$
10	$\frac{1}{(s+a)^m}$	$\frac{1}{(m-1)!}t^{m-1}e^{-at}$
11	$\frac{a}{s(s+a)}$	$1-e^{-at}$
12	$\frac{a}{s^2(s+a)}$	$\frac{1}{a}(at-1+e^{-at})$
13	$\frac{b-a}{(s+a)(s+b)}$	$e^{-at}-e^{-bt}$
14	$\frac{s}{(s+a)^2}$	$(1-at)e^{-at}$
15	$\frac{a^2}{s(s+a)^2}$	$1-e^{-at}(1+at)$
16	$\frac{(b-a)s}{(s+a)(s+b)}$	$be^{-at}-ae^{-at}$
17	$\frac{a}{(s^2+a^2)}$	$\sin at$
18	$\frac{s}{(s^2+a^2)}$	$\cos at$
19	$\frac{s+a}{(s+a)^2+b^2}$	$e^{-at}\cos bt$
20	$\frac{b}{(s+a)^2+b^2}$	$e^{-at}\sin bt$
21	$\frac{a^2+b^2}{s[(s+a)^2+b^2]}$	$1-e^{-at}\left(\cos bt+\frac{a}{b}\sin bt\right)$

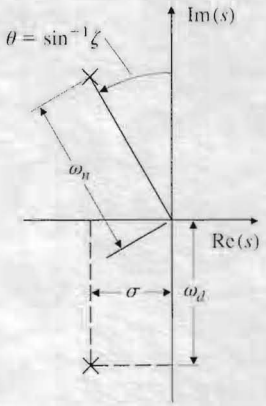
Design Aids

Closed Loop

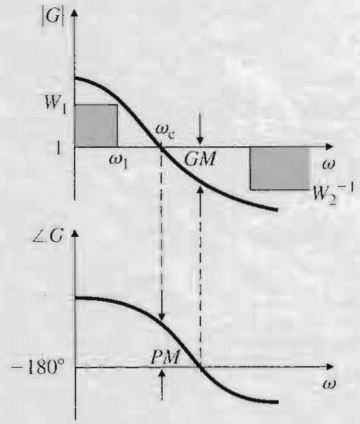








Open Loop



Design Relations

$$t_s = \frac{4.6}{\sigma} \qquad t_r = \frac{1.8}{\omega_n}$$

$$\sigma = \zeta\omega_n \qquad \omega_d = \omega_n\sqrt{1-\zeta^2}$$

$$e_{ss} = \frac{1}{1+K_0}, \qquad K_0 = |G(j\omega)|_{\omega=0}$$

$$|E| < \frac{1}{1+W_1}, \quad \omega < \omega_1$$

$$\omega_{BW} = \omega_c \qquad \text{for } PM = 90^\circ$$

$$\omega_{BW} = 2\omega_c \qquad \text{for } PM = 45^\circ$$

$$M_r \cong \frac{1}{2\sin(PM/2)}$$

$$M_p = 5\%, \qquad \zeta = 0.7$$

$$M_p = 15\%, \qquad \zeta = 0.5$$

$$M_p = 35\%, \qquad \zeta = 0.3$$

$$\zeta \cong \frac{PM}{100} \quad \text{for } PM < 70^\circ$$