

## 08.1 freqd.gain Transient response design by adjusting the gain

The following design procedure allows us to design for a desired percent overshoot. A similar procedure could be followed to design for a desired damping ratio.

1. Generate open-loop Bode plots with some convenient initial gain  $K_i$ .
2. Use either Fig. freqtime.1 or Eq. 6 and Eq. 7 to find the desired phase margin  $\Phi_M$ .
3. From the Bode phase plot, determine the frequency  $\omega_{\Phi_M}$  at which (180 deg minus the absolute value of) the phase is equal to the desired phase margin.
4. Change the gain to be such that the magnitude plot would intersect 0 dB at  $\omega_{\Phi_M}$ .

### Example 08.1 freqd.gain-1

Design a unity feedback gain controller for a system with the plant

$$G(s) = \frac{10}{(s + 90)(s + 30)}$$

such that the percent overshoot %OS is approximately 20%.

re: Percent overshoot design by adjusting the gain