trans.approx   Approx analytical transient response characteristics

Certain higher-order systems can be approximated as second-order systems and can be characterized by the parameters in the preceding section. This includes systems with zeros (in the preceding section we assumed the second-order system had no zeros). These conditions for "good approximation" are as follows. Each is necessary but by individually insufficient; together, they are sufficient.

higher−order poles and zeros are significantly leftward

Higher-order poles and any zeros have significantly more negative real parts than the dominant second-order poles. A typical guideline is that they should be at least five-times as negative. These poles and zeros contribute a relatively small amount to the transient response, since they decay much faster.

nearby higher−order poles and zeros nearly cancel

All poles near the dominant second-order pole pair are nearly canceled by nearby higher-order zeros and vice-versa (i.e. zeros near a dominant second-order pole pair are nearly cancelled by higher-order poles).