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Resonant peak $= M_r = \frac{1}{\left[2\xi\sqrt{1-\xi^2}\right]}$

Resonant freq $= \omega_r = \omega_n\sqrt{1-2\xi^2}$

The low freq region of Bode plot provides info regarding the steady state performance & high freq region provides info regarding transient state performance. The medium freq range provides info regarding stability.

Therefore, the low freq region of Bode plot is reshaped by lag compensation to improve steady state performance

The high freq region is reshaped by lead compensation to improve transient state performance.

When the system req improvement in both steady state & transient state lag-lead compensation can be employed to alter both high & low freq region of Bode

Primary function of lead compensator is to reshape the frequency response curve to provide sufficient phase lead angle to offset the excessive phase lag associated with the component of the plant

Primary function of lag compensator is to provide attenuation in the high freq region to achieve sufficient phase margin.