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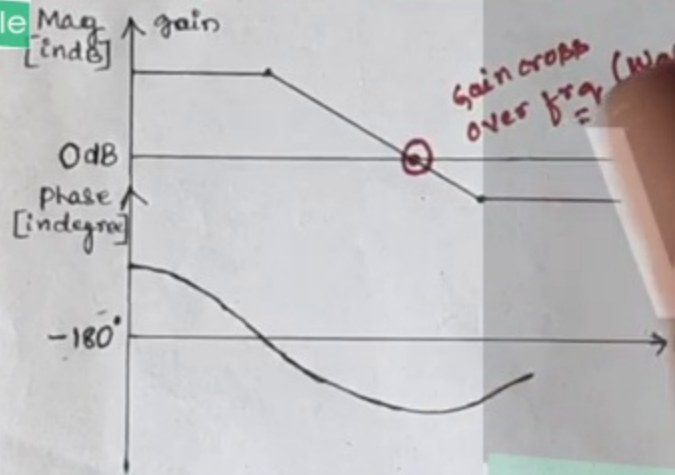
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Gain Margin [GM] & Phase Margin [PM] in Bode Plot:



Gain cross over freq. (ω_{gc})

Mathematically,

$$|G(j\omega)H(j\omega)|_{\omega=\omega_{gc}}$$

$$\frac{1}{\log_{10} |G(j\omega)H(j\omega)|_{\omega=\omega_{gc}}}$$

$$\angle G(j\omega)H(j\omega) |_{\omega=\omega_{gc}} - [(-180^\circ)]$$

$$- \angle G(j\omega)H(j\omega) |_{\omega=\omega_{gc}}$$

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[PM] in Bode Plot:

Mathematically,

$$GM = \frac{1}{|G(j\omega)H(j\omega)|_{\omega=\omega_{gc}}}$$

n dB,

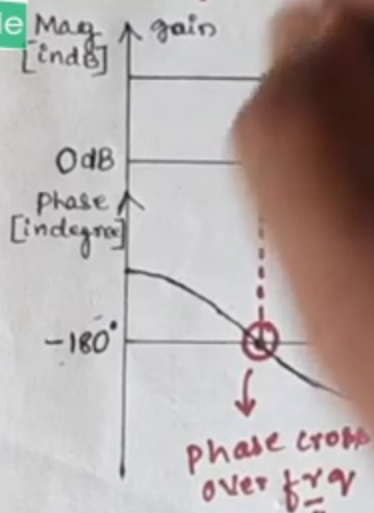
$$GM = 20 \log_{10} \frac{1}{|G(j\omega)H(j\omega)|_{\omega=\omega_{gc}}}$$

$$GM = -20 \log_{10} |G(j\omega)H(j\omega)|_{\omega=\omega_{gc}}$$

$$PM = [\angle G(j\omega)H(j\omega)|_{\omega=\omega_{gc}}] - [-180^\circ]$$

$$PM = 180^\circ + \angle G(j\omega)H(j\omega)|_{\omega=\omega_{gc}}$$

Gain Margin [GM]



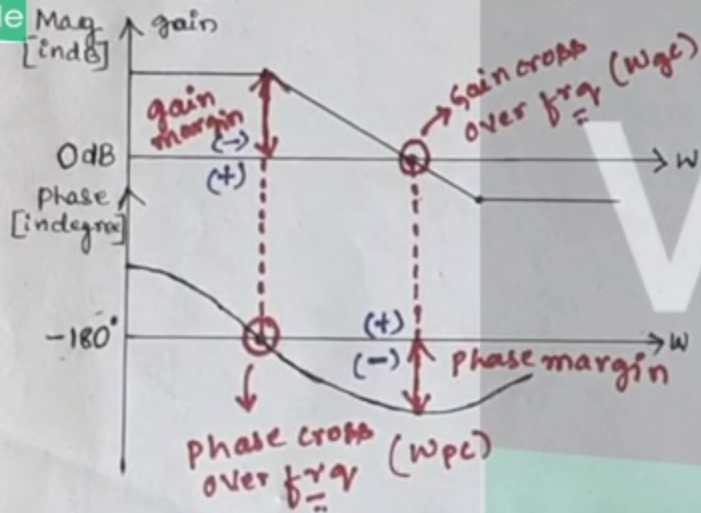
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V Gain Margin [GM] & Phase Margin [PM] in Bode Plot:

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 $\omega_{pc} > \omega_{gc} \rightarrow$

Mathematically,

$$GM = \frac{1}{|G(j\omega)H(j\omega)|_{\omega=\omega_{pc}}}$$

in dB,

$$GM = 20 \log_{10} \frac{1}{|G(j\omega)H(j\omega)|_{\omega=\omega_{pc}}}$$

$$GM = -20 \log_{10} |G(j\omega)H(j\omega)|_{\omega=\omega_{pc}}$$

$$PM = [\angle G(j\omega)H(j\omega) |_{\omega=\omega_{gc}}] - [(-180^\circ)]$$

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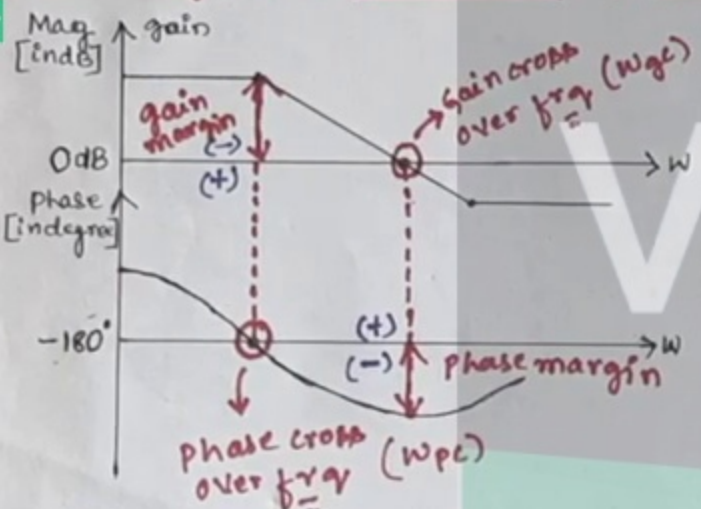
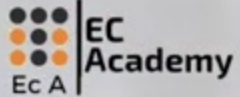
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Gain Margin [GM] & Phase Margin [PM] in Bode Plot:



Mathematically,

$$GM = \frac{1}{|G(j\omega)H(j\omega)|_{\omega=\omega_{pc}}}$$

in dB,

$$GM = 20 \log_{10} \frac{1}{|G(j\omega)H(j\omega)|_{\omega=\omega_{pc}}}$$

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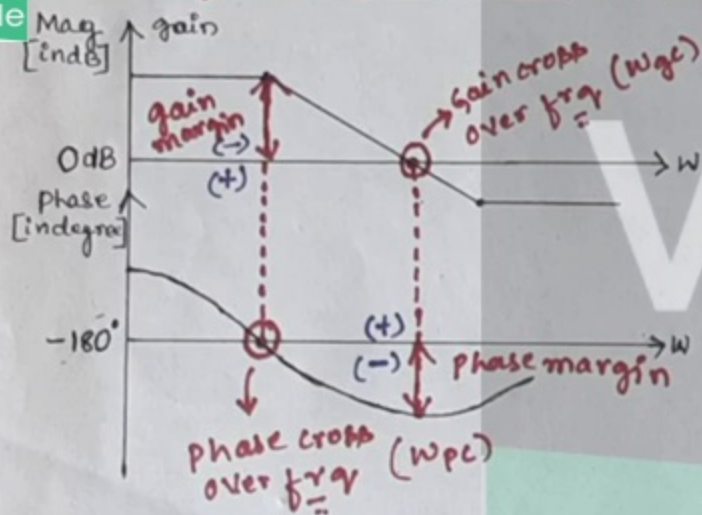
$$PM = \left[\angle G(j\omega)H(j\omega) \Big|_{\omega=\omega_{gc}} \right] - [(-180^\circ)]$$

$$PM = 180^\circ + \angle G(j\omega)H(j\omega) \Big|_{\omega=\omega_{gc}}$$

- $\omega_{pc} > \omega_{gc} \rightarrow$ S/m is stable
- $\omega_{pc} < \omega_{gc} \rightarrow$ S/m is unstable
- $\omega_{pc} = \omega_{gc} \rightarrow$ S/m is marginally stable



V Gain Margin [GM] & Phase Margin [PM] in Bode Plot:



Mathematically,

$$GM = \frac{1}{|G(j\omega)H(j\omega)|_{\omega=\omega_{pc}}}$$

in dB,

$$GM = 20 \log_{10} \frac{1}{|G(j\omega)H(j\omega)|_{\omega=\omega_{pc}}}$$

$$GM = -20 \log_{10} |G(j\omega)H(j\omega)|_{\omega=\omega_{pc}}$$

$$PM = [\angle G(j\omega)H(j\omega) |_{\omega=\omega_{gc}}] - [(-180^\circ)]$$

$$PM = 180^\circ + \angle G(j\omega)H(j\omega) |_{\omega=\omega_{gc}}$$

$\omega_{pc} > \omega_{gc} \rightarrow$ S/m is stable

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