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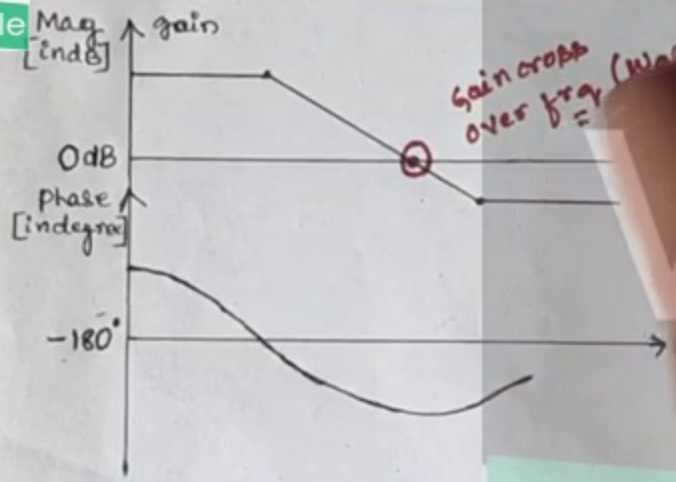
Dr. Asif Hassan

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



gain cross over freq. (

tically,

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

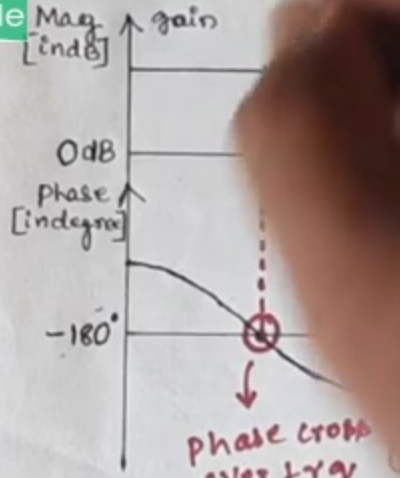
$$\frac{1}{|G(j\omega)H(j\omega)|_{\omega=\omega_{pc}}}$$

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

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

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

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



Mathematically,

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

In dB,

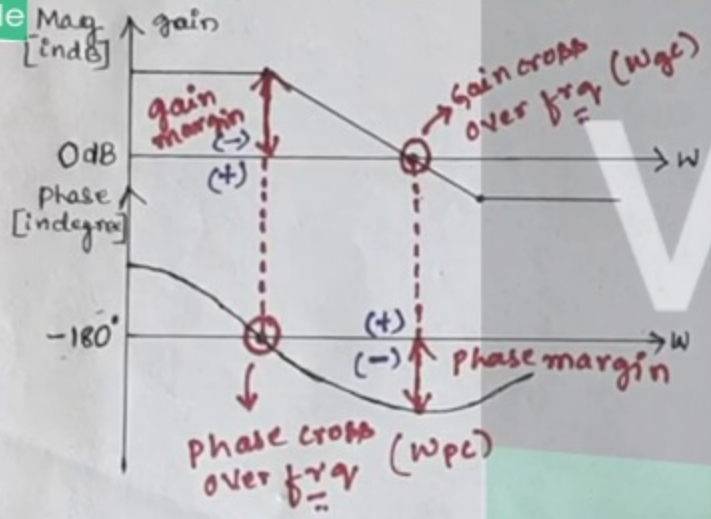
$$GM = 20\log_{10}\frac{1}{|G(j\omega)H(j\omega)|_{\omega=\omega_{pc}}}$$

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

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

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

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



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

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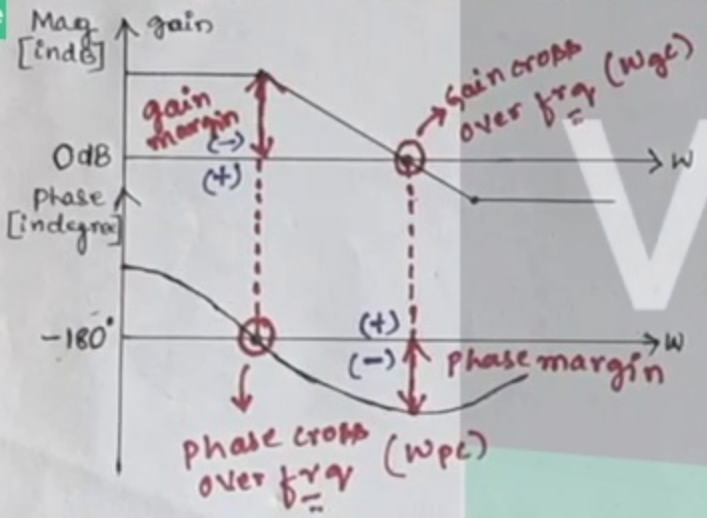

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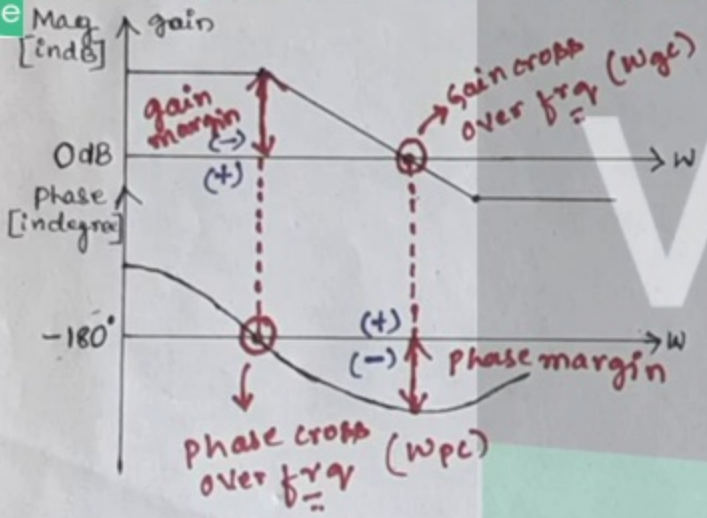
$$PM = 180^\circ + \angle G(j\omega)H(j\omega)\big|_{\omega=\omega_{gc}}$$

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

$\omega_{pc} < \omega_{gc}$ → S/m is unstable

$\omega_{pc} = \omega_{gc}$ → S/m is marginally stable

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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