Spring 2020

控制系統
Control Systems

Unit 6H
Closed-Loop Frequency Response

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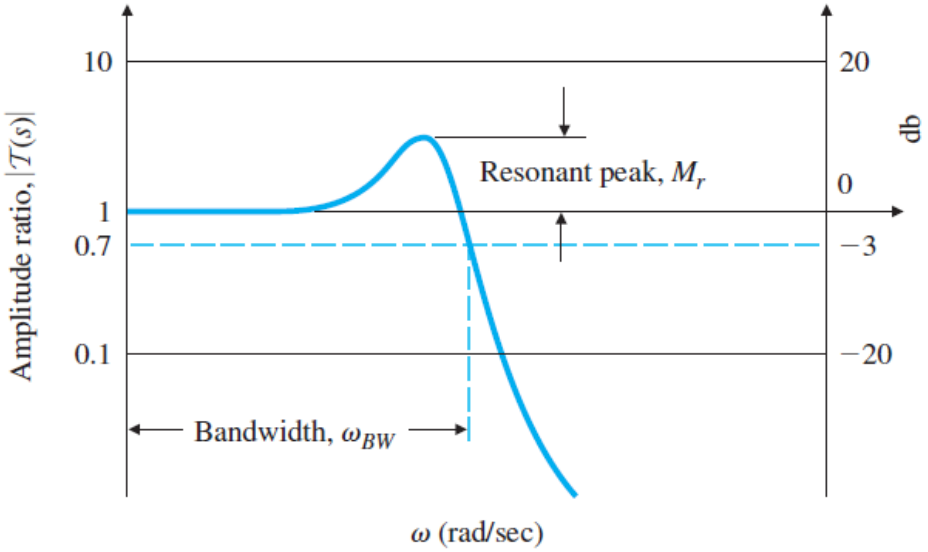
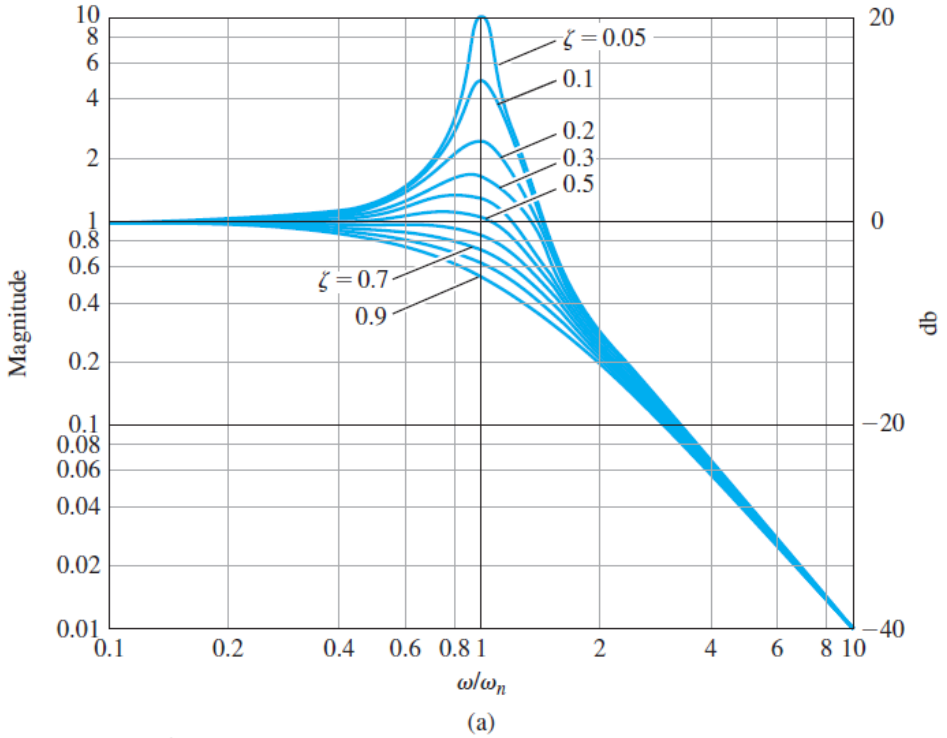
NTU-EE

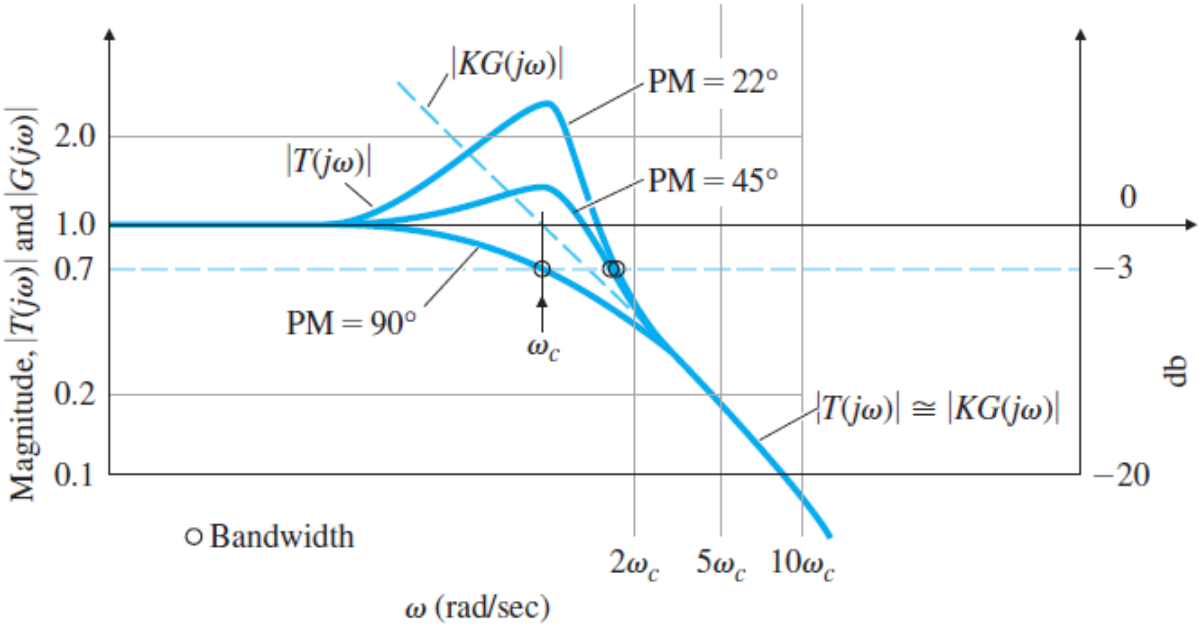
Mar 2020 – Jul 2020

Closed-Loop Frequency Response - Bandwidth





- Closed-Loop Bandwidth ω_{BW}



Closed-Loop Frequency Response - Bandwidth

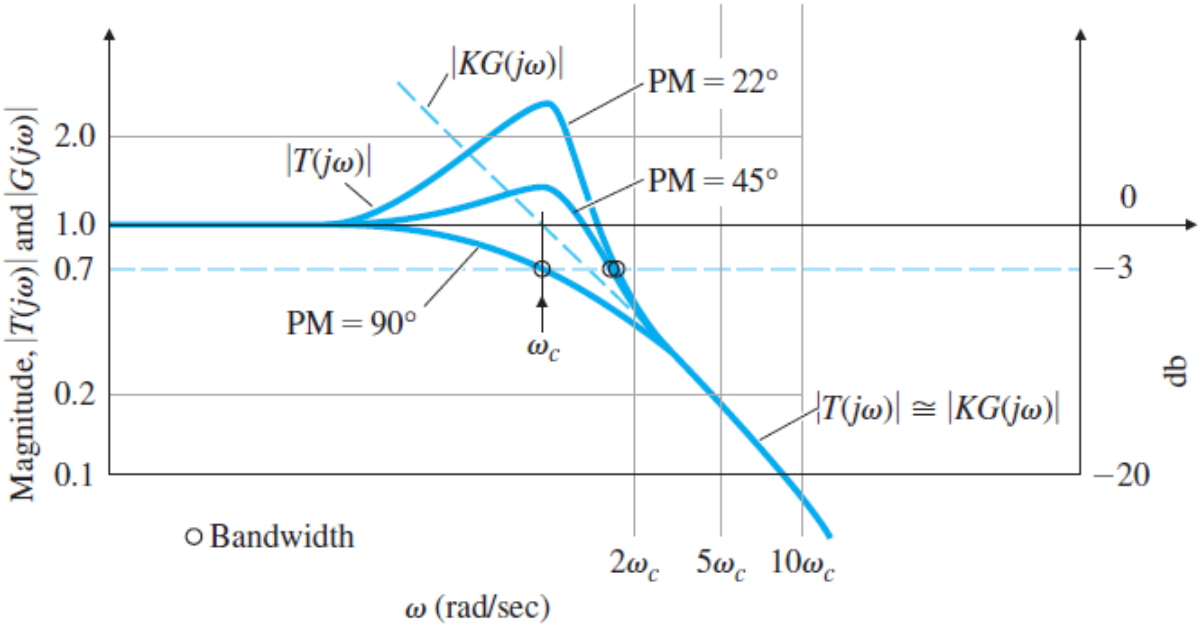
$|KG(jw)| >> 1 \quad$ for $w << w_c$

$|KG(jw)| << 1 \quad$ for $w >> w_c$

$$|\mathcal{T}(jw)| = \left|\frac{KG(jw)}{1+KG(jw)}\right| \approx \begin{cases} 1, & w << w_c \\ |KG|, & w >> w_c \end{cases}$$

near $w_c \quad |KG(jw)| = 1$

$|\mathcal{T}(jw)|$ depends heavily on the PM

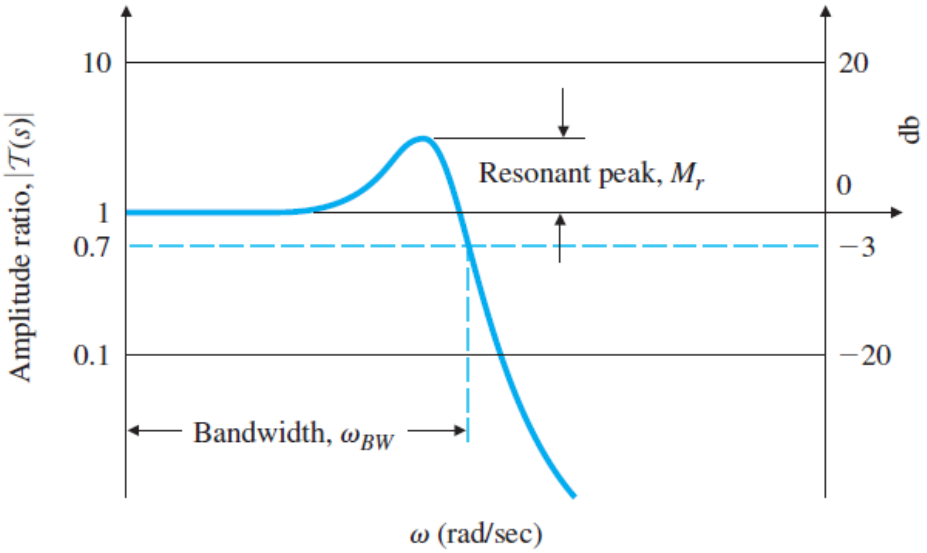


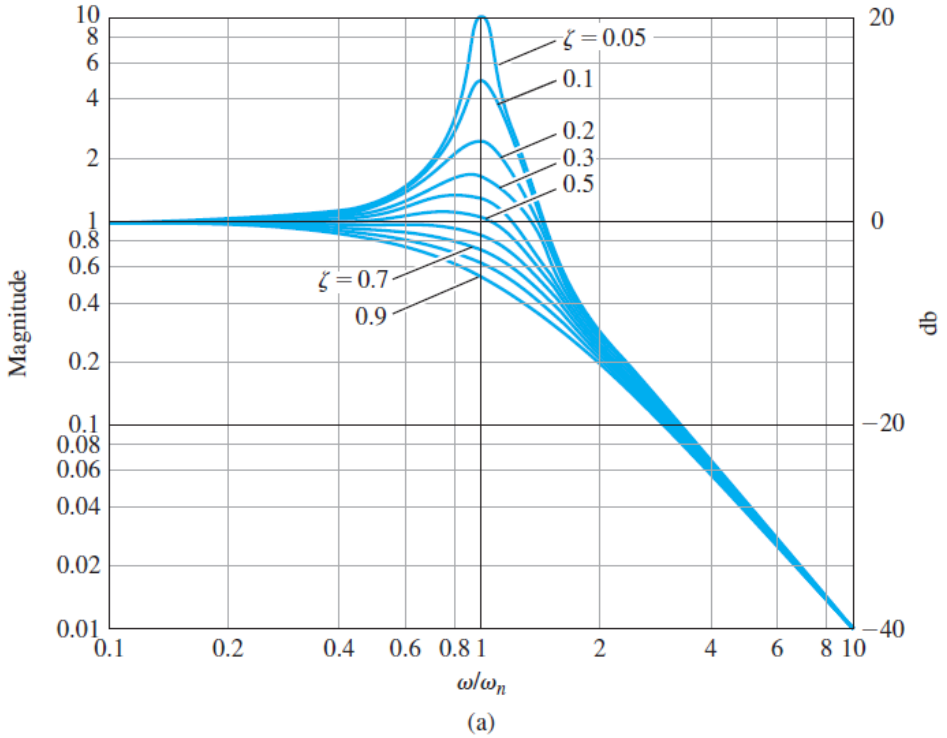
$|\mathcal{T}(jw_c)| = 1.31$

$|\mathcal{T}(jw_c)| = 0.707$

$\Rightarrow \; w_c \leq w_{BW} \leq 2w_c$

Closed-Loop Frequency Response - Resonant Peak





- Resonant-Peak Magnitude M_r