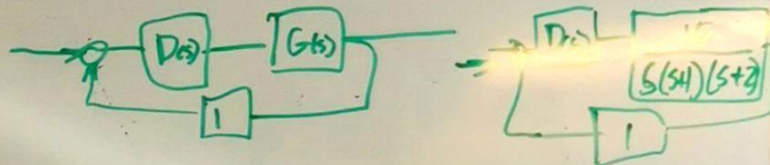


lec 4

$$G(s) = \frac{10}{s(s+1)(s+2)}$$



$\omega_n$  equal to or larger than  $\omega_n$  for  $G(s)$   
Crossover frequency

$$K_v = 10$$

$$PM \geq 45^\circ$$

$$GM \geq 10dB$$

Crossover old = 1.8 RAD/S we want to move the cross freq to achieve fast response  
Therefore we want to move the crossover freq  $\approx 3$  RAD/S

Lead controller

$$D_{lead}(s) = K \frac{s+a}{s+b}, a < b$$

$$a = 0.3, b = 30, K = 25$$

Find  $K_v$ :

$$K_v = \lim_{s \rightarrow 0} s \cdot D_{lead}(s) G(s) = \lim_{s \rightarrow 0} s \cdot 25 \frac{s+0.3}{s+30} \cdot \frac{10}{s(s+1)(s+2)} = \frac{0.3}{30} \cdot \frac{10}{2} = 0.5$$

$K_{v, req} = 10$  so we need a lag controller

lag controller

$$\frac{s+a}{s+b}$$

$$a > b$$

$b = 0.0001$  for fast DC

$$K_{v, total} = K_{v, lag} \cdot K_{v, lead}$$

$$10 = \frac{a}{b} \cdot 0.5$$

$$a = 20 \cdot b$$