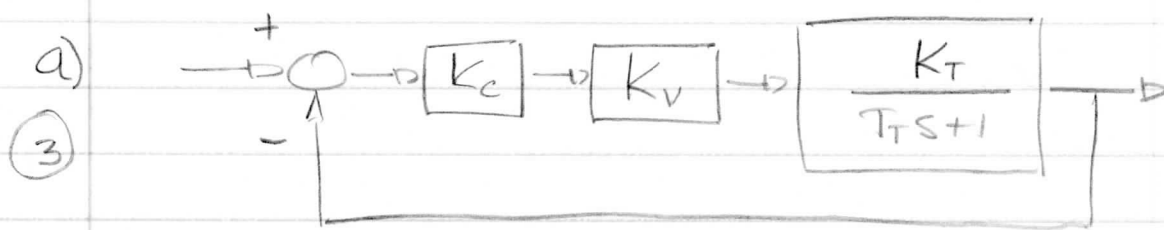


## Quiz 2 Solution



$\textcircled{2}$  b)  $G_{OL} = \frac{K_c K_v K_T}{T_T s + 1}$

c)  $G_{CL} = \frac{N_G}{D_G + N_G} = \frac{K_c K_v K_T}{T_T s + 1 + K_c K_v K_T}$

$\textcircled{3}$   $G_{CL} = \frac{K_c K_v K_T / (1 + K_c K_v K_T)}{\frac{T_T}{1 + K_c K_v K_T} s + 1}$

$\textcircled{2}$  d)  $T_{CL} = \frac{T_T}{1 + K_c K_v K_T}$

$\textcircled{2}$  e)  $K_{CL} = K_c K_v K_T / (1 + K_c K_v K_T)$

$\textcircled{2}$  f) Use  $G_{UFB} = G_{OL}$  in this case.  
Type is 0 because no free integrator.

g) Use for stability CLTF. Assuming  $T_T > 0$

$\textcircled{3}$   $1 + K_c K_v K_T > 0$   
 $\left| K_c > -\frac{1}{K_v K_T} \right\}, K_v, K_T > 0$

③ h) Step means use  $K_p$  to calc  $e_{ss}$ .  
Use  $G_{UFB}$ .

$$K_p = \lim_{s \rightarrow 0} G_{UFB} = \lim_{s \rightarrow 0} G_{OL} = K_c K_v K_T$$

$$e_{ss} = \frac{1}{1+K_p} = \frac{1}{1+K_c K_v K_T}$$