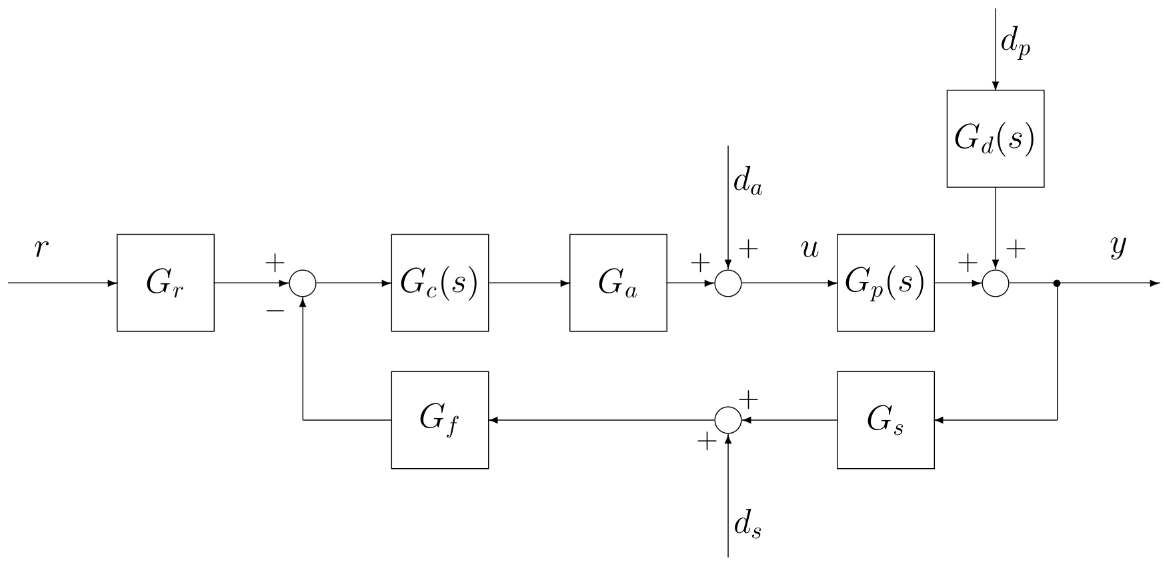
# 1 Consider the Feedback Control System below:




# 2 Formulary:

- $K_d = \frac{1}{G_f G_s}$
- $|e_r^\infty| = \left|\lim_{s\to 0} s \cdot \frac{K_d}{1+L(s)} \cdot \frac{R_0}{s^{h+1}}\right| = \left|\lim_{s\to 0} \frac{s^{\nu+p}K_d^2}{s^{\nu+p}K_d + K_cK_pG_a} \cdot \frac{R_0}{s^h}\right|$
- $|e_{da}^\infty| = \left|\lim_{s\to 0} s \cdot \frac{G_p(s)}{1+L(s)} \cdot \frac{D_{a0}}{s^{h+1}}\right| = \left|\lim_{s\to 0} \frac{s^{\nu}K_dK_p}{s^{\nu+p}K_d + K_cK_pG_a} \cdot \frac{D_{a0}}{s^h}\right|$
- $\left|e_{dp}^\infty\right| = \left|\lim_{s\to 0} s \cdot \frac{1}{1+L(s)} \cdot \frac{D_{p0}}{s^{h+1}}\right| = \left|\lim_{s\to 0} \frac{s^{\nu+p}K_d}{s^{\nu+p}K_d + K_cK_pG_a} \cdot \frac{D_{p0}}{s^h}\right|$
- $\left|e_{dp}^\infty\right| = \left|\frac{1}{1+L(j\omega_p)} \cdot a_p sin\left(\omega_p t\right)\right| < \rho \to |a_p| \cdot |S(j\omega_p)| < \rho \to M_S^{LF} = \frac{\rho}{|a_p|}$
  $(M_S^{LF})_{dB} + 40\log\left(\frac{\omega_S^-}{\omega_H}\right) = 0 \to \omega_L = \omega_p^+ \cdot 10^{\frac{-(M_S^{LF})_{dB}}{40}}; \quad \omega_c \geq 2\omega_L$