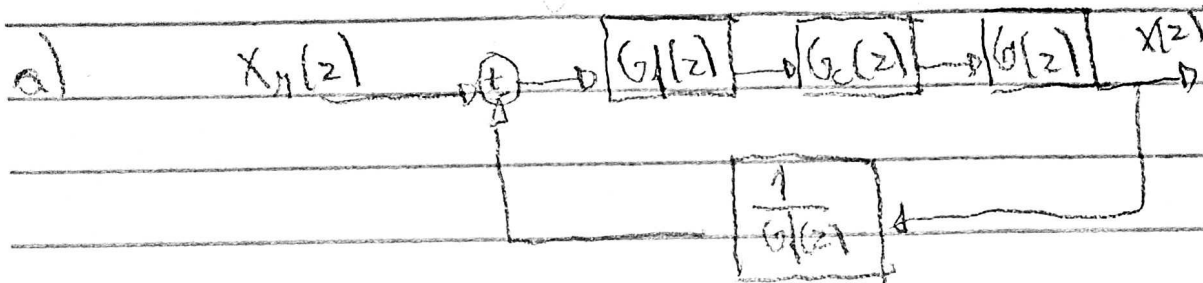


$$3) G(z) = \frac{50}{40z-1} = \frac{1,25}{z-0,025} \quad T=10s \quad p_{ss}=0$$

$$m_p = 0,1$$

$$m = 15$$

$$G_f(z) = 1$$



Como  $G_f(z) = 1$



Então  $G(z) = Z(G_{H0}(s) \cdot b(s)) = (1-z^{-1}) \cdot Z\left(\frac{b(s)}{s}\right) = (1-z^{-1}) \cdot Z\left(\frac{1,25}{s(1-0,025s)}\right)$

$$\frac{1,25}{s(1-0,025s)} = \frac{A}{s} + \frac{B}{s-0,025} \Rightarrow A = -50 \quad B = 50$$

$$Z\left(\frac{1,25}{s(1-0,025s)}\right) = \frac{-50z}{z-1} + \frac{50z}{z-1,025} \Rightarrow \frac{z-1}{z} \left( \frac{-50z}{z-1} + \frac{50z}{z-1,025} \right) \Rightarrow$$

$$G(z) = \frac{14,2}{z-1,025} \quad \text{e} \quad G_c(z) = \frac{K_c(z-z_c)}{(z-1)} \quad \text{para } z_{ss} = 0 \text{ em degrau}$$

Como  $m = 15 \Rightarrow m = 2\pi \Rightarrow 15 = \frac{2\pi}{\omega_d T} \Rightarrow \omega_d = \frac{2\pi}{150}$   $\omega_d = \omega_n \sqrt{1-\zeta^2} \Rightarrow \sqrt{1-\zeta^2} = \frac{2\pi}{150\omega_n}$

$m_p = e^{-\frac{5\pi}{\sqrt{1-\zeta^2}}} \Rightarrow \text{substituindo } \sqrt{1-\zeta^2} = \frac{2\pi}{150\omega_n} \Rightarrow m_p = e^{-\frac{5\pi \cdot 150\omega_n}{2\pi}} = 0,1$  log nos dois lados

$$2,3026 = 75\omega_n \Rightarrow \omega_n = 0,0307$$

$$\text{Logo } \omega_m = 0,0307 \text{ e } \omega_d = \frac{2\pi}{150}$$

$$\text{Como } z = e^{st} = e^{-j\omega_m T} \cdot e^{j\omega_d T \sqrt{1-\zeta^2}} \Rightarrow e^{-0,307} \cdot e^{j \frac{2\pi}{15}}$$

$$\Downarrow$$

$$|z| = 0,7357 \Rightarrow z = 0,6721 + 0,2993j$$

$$\angle z = 0,4189 \text{ rad}$$

$$\text{Como } G_c(z)/G(z) = \frac{14,2 K_c (z - z_c)}{(z-1)(z-1,284)}$$

$$\angle G_c(z)/G(z) = \phi_{z_c} - 180 + \angle_{\text{om}} \left( \frac{0,2993}{1 - 0,6721} \right) - 180 + \angle_{\text{om}} \left( \frac{0,2993}{1,284 - 0,6721} \right)$$

$$\angle G_c(z)/G(z) = \phi_{z_c} - 137,6108 - 153,9353$$

$$= \phi_{z_c} - 291,5461 = -180$$

$$\phi_{z_c} = 111,5461$$

$$\Downarrow$$

$$\phi_{z_c} = 180 - \angle_{\text{om}} \left( \frac{0,2993}{z_c - 0,6721} \right) \Rightarrow 111,5461 - 180 = -\angle_{\text{om}} \left( \frac{0,2993}{z_c - 0,6721} \right)$$

$$68,4539 = \angle_{\text{om}} \left( \frac{0,2993}{z_c - 0,6721} \right), \text{ tom mais dividido}$$

$$-253,27 = \frac{0,2993}{z_c - 0,6721} \Rightarrow z_c = 0,7903$$

$$\text{Logo } G_c(z)/G(z) = \frac{14,2 K_c (z - 0,7903)}{(z-1)(z-1,284)}$$

$$\left| \frac{G_c(z)}{G(z)} \right| = 1 \Rightarrow \left| \frac{14,2 K_c (z - 0,7903)}{(z-1)(z-1,284)} \right| = 1$$

$$z = 0,6721 + 0,2993j$$

$$\frac{14,2 K_c \cdot 0,3218}{0,444 \cdot 0,6812} = 1 \Rightarrow K_c = 0,0662$$

$$\text{Logo } G_c(z) = 0,0662 \cdot \frac{(z - 0,7903)}{(z-1)}$$