Aplicație consultații TS

Este considerat sistemul de reglare automată cu schema bloc prezentată în figura 1, în care $r(t)$ este referința și $e(t)$ este eroarea de reglare. Sunt considerate 2 variante de regulatoare (R) cu MM-ISI:

$\boxed{R_1}$: $k\dot{e}(t) + \frac{k}{T_1} e(t) - \dot{u}(t) = 0$

$\boxed{R_2}$: $kT_1\dot{e}(t) + ke(t) - T_2\dot{u}(t) - u(t) = 0$

Se cere:

① Calculați caracteristicile de transfer, adică funcția de transfer $H_{z,r}(s)$ în raport cu referința, funcția de transfer $H_{z,d}(s)$ în raport cu perturbația $d(t)$, considerând ieșirea $z(t)$ și funcția de transfer a sistemului deschis $H_0(s)$ ($e(t)$ este intrarea și $y'(t)$ este ieșirea) pentru:

- R_1: $T_1 = 2{,}5$ sec
- R_2: $T_1 = 2{,}5$ sec, $T_2 = 0{,}1$ sec

② Găsiți valorile parametrului $k>0$ pentru care SRA este stabil.

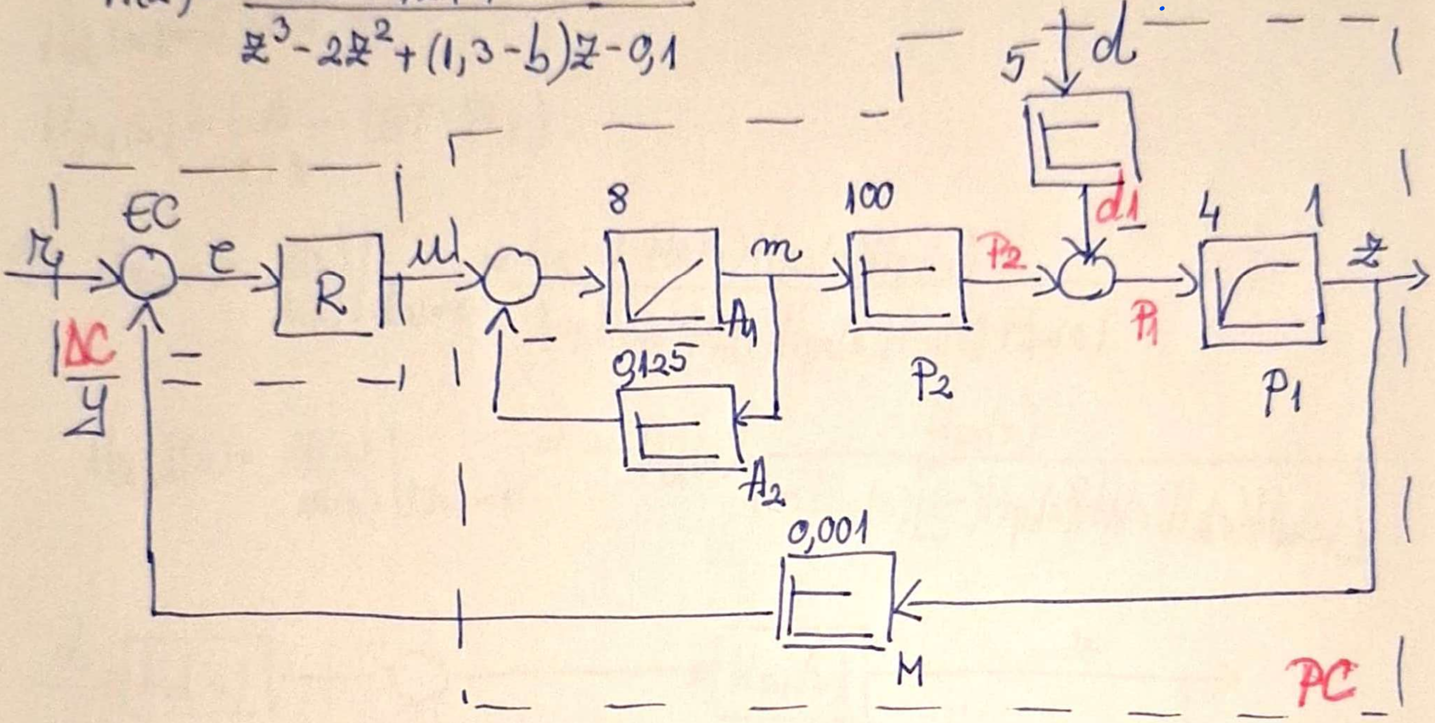
③ Acceptând că sistemul este stabil, alegând o valoare arbitrară a lui $k>0$, pentru $r_\infty = 8$ și $d_\infty = 100$, calculați VRSC $\{e_\infty, u_\infty, m_\infty, y_\infty, z_\infty\}$

④ Calculați valorile celor 2 parametri k_r și k_d ai caracteristicilor statice $z_\infty = k_r r_\infty + k_d d_\infty$

⑤ Dacă intervine un defect în funcționarea sistemului, caracterizat prin scoaterea din funcțiune a blocului A_2, analizați efectele acestui defect asupra punctului ② (stabilitatea sistemului) și asupra punctului ④ (caracteristicile statice)

⑥ Determinați valorile parametrului real b care garantează stabilitatea sistemului liniar în timp discret cu funcția de transfer:

$$H(z)=\frac{-3z^2+4z+1}{z^3-2z^2+(1{,}3-b)z-0{,}1}$$



$\boxed{R_1}$ $k\dot{e}(t)+\frac{k}{T_1}e(t)-\dot{u}(t)=0 \longrightarrow ks\,e(s)+\frac{k}{T_1}e(s)-s\,u(s)=0$

$\Rightarrow s\,u(s)=k\left(s+\frac{1}{T_1}\right)e(s) \Rightarrow s\,u(s)=\frac{k(1+sT_1)}{T_1}e(s) \Rightarrow H_R(s)=\frac{u(s)}{e(s)}=\frac{k(1+sT_1)}{sT_1}$

$\Rightarrow \boxed{H_R(s)=\frac{u(s)}{e(s)}=\frac{k(1+sT_1)}{sT_1}\ (ET\text{-}PI)}$

$\boxed{R_2}$ $kT_1\dot{e}(t)+ke(t)-T_2\dot{u}(t)-u(t)=0 \longrightarrow kT_1 s\,e(s)+ke(s)=T_2 s\,u(s)+u(s)$

$\Rightarrow u(s)(1+sT_2)=k(1+sT_1)e(s)$ $\Rightarrow \boxed{H_R(s)=\frac{u(s)}{e(s)}=\frac{k(1+sT_1)}{1+sT_2}\ (ET\text{-}PDT_1)}$

① $\left.\begin{aligned} &H_{A_1}(s)=\frac{8}{s}\ (ET\text{-}I)\\ &H_{A_2}(s)=0{,}125\ (ET\text{-}P)\end{aligned}\right\} \Rightarrow H_A(s)=\frac{H_{A_1}(s)}{1+H_{A_1}(s)H_{A_2}(s)}=\frac{\frac{8}{s}}{1+\frac{8}{s}\cdot 0{,}125} \Rightarrow$

$$\Rightarrow H_A(s) = \frac{\frac{8}{s}}{1+\frac{1}{s}} = \frac{8}{s}\cdot\frac{s}{s+1} \rightarrow H_A(s) = \frac{8}{1+s}\ (ET\text{-}PT_1)$$

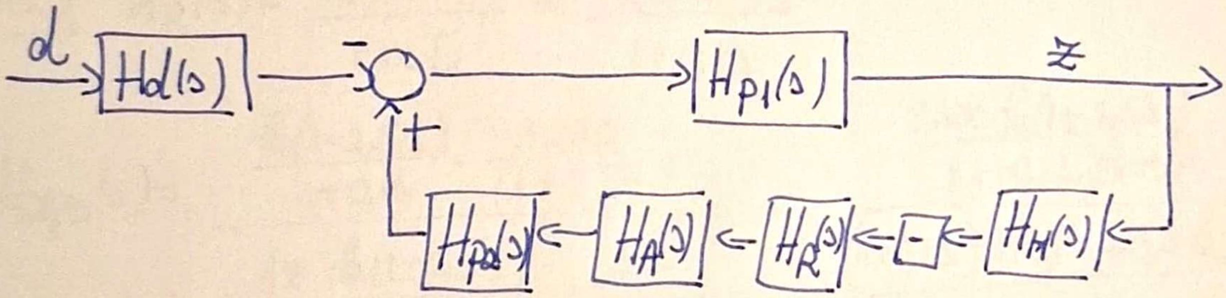
$$H_{p2}(s) = 100\ (ET\text{-}P) \qquad H_M(s) = 0{,}001\ (ET\text{-}P)$$

$$H_d(s) = 5\ (ET\text{-}P)$$

$$H_{p1}(s) = \frac{4}{1+s}\ (ET\text{-}PT_1)$$

① $$H_{z,r}(s) = \left.\frac{Z(s)}{r(s)}\right|_{d(s)=0} = \frac{H_R(s)\cdot H_A(s) H_{p2}(s) H_{p1}(s)}{1 + H_R(s) H_A(s) H_{p2}(s) H_{p1}(s)\cdot H_M(s)}$$

$$H_{z,d}(s) = \left.\frac{Z(s)}{d(s)}\right|_{r(s)=0} = -H_d(s)\frac{H_{p1}(s)}{1 - H_{p1}(s)\left[(-)H_{p2}(s) H_A(s) H_R(s) H_M(s)\right]}$$



$$\Rightarrow H_{z,d}(s) = -H_d(s)\cdot\frac{H_{p1}(s)}{1 + H_R(s) H_A(s) H_{p2}(s) H_{p1}(s) H_M(s)}$$

$$H_0(s) = H_R(s)\cdot H_{pc}(s) = H_R(s)\cdot H_A(s) H_{p2}(s) H_{p1}(s) H_M(s)$$

$$H_{pc}(s) = H_A(s) H_{p2}(s) H_{p1}(s) H_M(s) = \frac{8}{1+s}\cdot 100\cdot\frac{4}{1+s}\cdot 0{,}001 = \frac{3{,}2}{(1+s)(1+s)}\ (ET\text{-}PT_2)$$

$\boxed{R_1}$: $$H_R(s) = \frac{k_R(1+sT_1)}{sT_1} = \frac{k_R(1+2{,}5s)}{2{,}5s}$$

$$H_{z,r}(s) = \frac{\frac{k_R(1+2{,}5s)}{2{,}5s}\cdot\frac{3200}{(1+s)^2}}{1 + \frac{k_R(1+2{,}5s)}{2{,}5s}\cdot\frac{3{,}2}{(1+s)^2}} = \frac{\frac{1280 k_R(1+2{,}5s)}{\cancel{s(1+s)^2}}}{\frac{s(1+s)^2 + 1{,}28 k_R(1+2{,}5s)}{\cancel{s(1+s)^2}}}$$

$$H_{z,r}(s)=\frac{1280k(1+2{,}5s)}{s(s^2+2s+1)+1{,}28k+3{,}2ks} \Rightarrow \boxed{H_{z,r}(s)=\frac{1280k(1+2{,}5s)}{s^3+2s^2+s(3{,}2k+1)+1{,}28k}}$$

$$H_{z,d}(s)=-5\cdot\frac{\frac{4}{1+s}}{1+\frac{k(1+2{,}5s)}{2{,}5s}\cdot\frac{3{,}2}{(1+s)^2}}=-\frac{\frac{20}{1+s}}{\frac{s(1+s)^2+1{,}28k(1+2{,}5s)}{s(1+s)^2}}$$

$$=-\frac{20s(1+s)}{s^3+2s^2+s(3{,}2k+1)+1{,}28k} \Rightarrow \boxed{H_{z,d}(s)=-\frac{20s(1+s)}{s^3+2s^2+(3{,}2k+1)s+1{,}28k}}$$

$$H_0(s)=\frac{k(1+2{,}5s)}{2{,}5s}\cdot\frac{3{,}2}{(1+s)^2} \Rightarrow \boxed{H_0(s)=\frac{1{,}28k(1+2{,}5s)}{s(1+s)^2}}$$

$\boxed{R_2}$: $$H_R(s)=\frac{k(1+sT_1)}{1+sT_2}=\frac{k(1+2{,}5s)}{1+0{,}1s}$$

$$H_{z,r}(s)=\frac{\frac{k(1+2{,}5s)}{1+0{,}1s}\cdot\frac{3200}{(1+s)^2}}{1+\frac{k(1+2{,}5s)}{1+0{,}1s}\cdot\frac{3{,}2}{(1+s)^2}}=\frac{\frac{3200k(1+2{,}5s)}{\cancel{(1+0{,}1s)(1+s)^2}}}{\frac{(1+0{,}1s)(1+s)^2+3{,}2k(1+2{,}5s)}{\cancel{(1+0{,}1s)(1+s)^2}}}$$

$$=\frac{3200k(1+2{,}5s)}{(1+0{,}1s)(s^2+2s+1)+3{,}2k+8ks} \Rightarrow \boxed{H_{z,r}(s)=\frac{3200k(1+2{,}5s)}{0{,}1s^3+1{,}2s^2+s(8k+2{,}1)+3{,}2k}}$$

$$H_{z,d}(s)=-5\cdot\frac{\frac{4}{1+s}}{1+\frac{k(1+2{,}5s)}{1+0{,}1s}\,\frac{3{,}2}{(1+s)^2}}=-\frac{\frac{20}{1+s}}{\frac{0{,}1s^3+1{,}2s^2+(8k+2{,}1)s+3{,}2k+1}{(1+0{,}1s)(1+s)^2}}$$

$$\Rightarrow \boxed{H_{z,d}(s)=\frac{-20(1+0{,}1s)(1+s)}{0{,}1s^3+1{,}2s^2+(8k+2{,}1)s+3{,}2k+1}}$$

$$H_0(s)=\frac{k(1+2{,}5s)}{1+0{,}1s}\cdot\frac{3{,}2}{(1+s)^2} \Rightarrow \boxed{H_0(s)=\frac{3{,}2k(1+2{,}5s)}{(1+0{,}1s)(1+s)^2}}$$

② $\boxed{R_1}$: $\Delta(s) = s^3+2s^2+(3{,}2k+1)s+1{,}28k = a_3 s^3 + a_2 s^2 + a_1 s + a_0$

$$\Delta(s) = 1+H_0(s) = 1+\frac{1{,}28k(1+2{,}5s)}{s(1+s)^2} \Rightarrow \Delta(s) = s(1+s)^2+1{,}28k(1+2{,}5s) \Rightarrow$$

$$\Delta(s) = s(s^2+2s+1)+1{,}28k+3{,}2ks = s^3+2s^2+s(1+3{,}2k)+1{,}28k$$

Sunt impuse condițiile necesare specificate în T_2:

$$\left.\begin{aligned} & a_3 = 1 > 0 \\ & a_2 = 2 > 0 \\ & a_1 = 3{,}2k+1 > 0 \Rightarrow 3{,}2k > -1 \Rightarrow k > -0{,}3125 \Rightarrow k \in (-0{,}3125; +\infty) \\ & a_0 = 1{,}28k > 0 \Rightarrow k \in (0, +\infty) \end{aligned}\right\} \Rightarrow$$

$k \in (-0{,}3125; +\infty) \cap (0; +\infty) \Rightarrow$ $\boxed{k \in (0; +\infty)\ (*)}$

$$n=3 \Rightarrow H = \begin{bmatrix} a_2 & a_0 & 0 \\ a_3 & a_1 & 0 \\ 0 & a_2 & a_0 \end{bmatrix} = \begin{bmatrix} 2 & 1{,}28k & 0 \\ 1 & 3{,}2k+1 & 0 \\ 0 & 2 & 1{,}28k \end{bmatrix}$$

Sunt impuse condițiile de stabilitate (condițiile suficiente):

$\det(H_1) = 2 > 0$

$\det(H_2) = 2(3{,}2k+1) - 1{,}28k = 6{,}4k+2-1{,}28k = 5{,}12k+2 > 0 \Rightarrow$

$k > -0{,}390625 \Rightarrow k \in (-0{,}390625; +\infty)$

$\det(H) = a_0 \det(H_2) = 1{,}28k(5{,}12k+2) > 0 \Rightarrow k \in (0; +\infty) \cap (-0{,}390625; +\infty)$

$\Rightarrow k \in (0; +\infty)$

$\Rightarrow k \in (0; +\infty) \cap (-0{,}390625; +\infty) \Rightarrow$ $\boxed{k \in (0; +\infty)\ (**)}$

din $(*)$ și $(**)$ $\Rightarrow$ $\boxed{k \in (0; +\infty)}$

$\boxed{R_2}$: $\Delta(s) = 0{,}1s^3 + 1{,}2s^2 + (8k+2{,}1)s + 3{,}2k+1 = a_3s^3 + a_2s^2 + a_1s + a_0$

Sunt impuse <u>condițiile necesare</u>:

$a_3 = 0{,}1 > 0$

$a_2 = 1{,}2 > 0$

$$\left.\begin{array}{l} a_1 = 8k+2{,}1 > 0 \Rightarrow k > -0{,}2625 \Rightarrow k \in (-0{,}2625; +\infty) \\ a_0 = 3{,}2k+1 > 0 \Rightarrow k > -0{,}3125 \Rightarrow k \in (-0{,}3125; +\infty) \end{array}\right\} \Rightarrow$$

$k \in (0; +\infty) \cap (-0{,}2625; +\infty) \cap (-0{,}3125; +\infty) \Rightarrow \boxed{k \in (0; +\infty) (*)}$

$$n = 3 \Rightarrow H = \begin{bmatrix} a_2 & a_0 & 0 \\ a_3 & a_1 & 0 \\ 0 & a_2 & a_0 \end{bmatrix} = \begin{bmatrix} 1{,}2 & 3{,}2k+1 & 0 \\ 0{,}1 & 8k+2{,}1 & 0 \\ 0 & 1{,}2 & 3{,}2k+1 \end{bmatrix} \Rightarrow$$

Sunt impuse <u>condițiile suficiente</u>:

$\det(H_1) = 1{,}2 > 0$

$\det(H_2) = 1{,}2(8k+2{,}1) - 0{,}1(3{,}2k+1) = 9{,}6k + 2{,}52 - 0{,}32k - 0{,}1 =$

$= 9{,}28k + 2{,}42 > 0 \Rightarrow k > -0{,}2608 \Rightarrow k \in (-0{,}2608; +\infty)$

$\det(H) = a_0 \det(H_2) = (3{,}2k+1)(9{,}28k+2{,}42) \Rightarrow k \in (-0{,}2608; +\infty) \cap (-0{,}3125; +\infty)$

$\Rightarrow k \in (-0{,}2608; +\infty)$

$\Rightarrow k \in (0; +\infty) \cap (-0{,}2608; +\infty) \Rightarrow \boxed{k \in (0; +\infty) (**)}$

Din $(*)$ și $(**)$ $\Rightarrow \boxed{k \in (0; +\infty)}$

(3) $\boxed{R_1}$: RG-PI $\Rightarrow \boxed{e_\infty = 0}$

$$\left.\begin{array}{l} e_\infty = 0 \\ e_\infty = r_\infty - y_\infty \end{array}\right\} \Rightarrow y_\infty = r_\infty = 8 \Rightarrow \boxed{y_\infty = 8}$$

$m_\infty = 8 \cdot u_\infty \Rightarrow \boxed{m_\infty = 25}$

$p_{2\infty} = 100 m_\infty = 800 u_\infty$

$d_{1\infty} = 5 d_\infty = 500$

$p_{1\infty} = p_{2\infty} - d_{1\infty} = 800 u_\infty - 500$

$z_\infty = 4 p_{1\infty} = 3200 u_\infty - 2000 \Rightarrow \boxed{z_\infty = 8000}$

$y_\infty = 0{,}001 z_\infty = 3{,}2 u_\infty - 2 = 8 \Rightarrow \boxed{u_\infty = 3{,}125}$

$\boxed{R_2}$: $\left.\begin{array}{l} RG\text{-}P\Delta T_1 \Rightarrow e_\infty \neq 0 \\ e_\infty = r_\infty - y_\infty \end{array}\right\} \Rightarrow y_\infty = 8 - e_\infty \Rightarrow \boxed{y_\infty = 6{,}6487} \cong 6{,}649$

$\left.\begin{array}{l} u_\infty = k \cdot e_\infty \\ k = 2 \end{array}\right\} \Rightarrow u_\infty = 2e_\infty \Rightarrow \boxed{u_\infty = 2{,}7026} \cong 2{,}703$

$m_\infty = 8u_\infty = 16e_\infty \Rightarrow \boxed{m_\infty = 21{,}6208} \cong 21{,}62$

$p_{2\infty} = 100u_\infty = 1600e_\infty$

$d_{1\infty} = 5d_\infty = 500$

$p_{1\infty} = p_{2\infty} - d_{1\infty} = 1600e_\infty - 500$

$z_\infty = 4p_{1\infty} = 6400e_\infty - 2000 \Rightarrow \boxed{z_\infty = 6648,} \cong 6649$

$y_\infty = 0{,}001 z_\infty = 6{,}4e_\infty - 2 = 8 - e_\infty \Rightarrow 7{,}4e_\infty = 10 \Rightarrow \boxed{e_\infty = 1{,}3513}$

4) $\boxed{R_1}$: $z(s) = H_{z,r}(s)r(s) + H_{z,d}(s)d(s) \xrightarrow{RSC} z_\infty = H_{z,r}(0)r_\infty + H_{z,d}(0)d_\infty$

$\Rightarrow z_\infty = k_r r_\infty + k_d d_\infty$

$\left.\begin{array}{l} k_r = H_{z,r}(0) = \dfrac{1280k}{1{,}28k} = 1000 \\ k_d = H_{z,d}(0) = 0 \end{array}\right\} \boxed{z_\infty = 1000r_\infty + 0 \cdot d_\infty}$

$\boxed{k_r = 1000}$ și $\boxed{k_d = 0}$

$\boxed{R_2}$: $\left.\begin{array}{l} k_r = H_{z,r}(0) = \dfrac{3200k}{3{,}2k+1} \\ k_d = H_{z,d}(0) = \dfrac{-20}{3{,}2k+1} \end{array}\right\} \Rightarrow \boxed{z_\infty = \dfrac{3200k}{3{,}2k+1} r_\infty - \dfrac{20}{3{,}2k+1} d_\infty}$

$\boxed{k_r = \dfrac{3200k}{3{,}2k+1}}$ și $\boxed{k_d = \dfrac{-20}{3{,}2k+1}}$

5) $\boxed{R_1}$: $H_{PC}(s) = H_A(s) \cdot H_{P2}(s) \cdot H_{P1}(s) \cdot H_M(s) = \dfrac{8}{s} \cdot 100 \cdot \dfrac{4}{1+s} \cdot 0{,}001 = \dfrac{3{,}2}{s(1+s)}$ (ET-iT$_1$)

$$H_{z,r}(s) = \frac{\dfrac{k(1+2{,}5s)}{2{,}5s} \cdot \dfrac{3200}{s(1+s)}}{1 + \dfrac{k(1+2{,}5s)}{2{,}5s} \cdot \dfrac{3200}{s(1+s)}} = \frac{1280k(1+2{,}5s)}{s^2(1+s) + 1{,}28k(1+2{,}5s)}$$

$$\boxed{H_{z,r}(s)=\frac{1280k(1+2{,}5s)}{s^3+s^2+3{,}2ks+1{,}28k}}$$

$$H_{z,d}(s)=-5\cdot\frac{\frac{4}{1+s}}{\frac{s^3+s^2+3{,}2ks+1{,}28k}{s^2(1+s)}}=-\boxed{\frac{20s^2}{s^3+s^2+3{,}2ks+1{,}28k}}$$

$$\Delta(s)=s^3+s^2+3{,}2ks+1{,}28k=a_3s^3+a_2s^2+a_1s+a_0$$

Sunt impuse condițiile necesare:

$$\left.\begin{array}{l} a_3=1>0 \\ a_2=1>0 \\ a_1=3{,}2k>0\Rightarrow k\in(0;+\infty) \\ a_0=1{,}28k>0\Rightarrow k\in(0;+\infty)\end{array}\right\}\Rightarrow \boxed{k\in(0;+\infty)\ (*)}$$

$$n=3\Rightarrow H=\begin{bmatrix} a_2 & a_0 & 0\\ a_3 & a_1 & 0\\ 0 & a_2 & a_0\end{bmatrix}=\begin{bmatrix} 1 & 1{,}28k & 0\\ 1 & 3{,}2k & 0\\ 0 & 1 & 1{,}28k\end{bmatrix}$$

Sunt impuse condițiile de stabilitate:

$$\det(H_1)=1>0$$

$$\det(H_2)=3{,}2k-1{,}28k=1{,}92k>0\Rightarrow k\in(0;+\infty)$$

$$\det(H)=a_0\det(H_2)=1{,}28k\cdot1{,}92k=2{,}4576>0$$

$$\Rightarrow \boxed{k\in(0;+\infty)\ (**)}$$

din $(*)$ și $(**)$ $\Rightarrow \boxed{k\in 0;+\infty)}$

$$k_r=H_{z,r}(0)=\frac{1280k}{1{,}28k}=1000\Rightarrow\boxed{k_r=1000}$$

$$k_d=H_{z,d}(0)=0\Rightarrow\boxed{k_d=0}$$

$\boxed{R_2}$: $$H_{z,r}(s)=\frac{\frac{k(1+2{,}5s)}{1+0{,}1s}\cdot\frac{3200}{s(1+s)}}{1+\frac{k(1+2{,}5s)}{1+0{,}1s}\cdot\frac{3{,}2}{s(1+s)}}=\frac{\frac{3200k(1+2{,}5s)}{\cancel{s(1+0{,}1s)(1+s)}}}{\frac{s(1+0{,}1s)(1+s)+3{,}2k+8ks}{\cancel{s(1+0{,}1s)(1+s)}}}=$$

$$=\frac{3200k(1+2{,}5s)}{s(0{,}1s^2+1{,}1s+1)+8ks+3{,}2k}\Rightarrow\boxed{H_{z,r}(s)=\frac{3200k(1+2{,}5s)}{0{,}1s^3+1{,}1s^2+(8k+1)s+3{,}2k}}$$

$$H_{z,d}(s) = \frac{\frac{-20}{1+s}}{\frac{0,1s^3+1,1s^2+(8k+1)s+3,2k}{s(1+0,1s)(1+s)}} = \boxed{-\frac{20s(1+0,1s)}{0,1s^3+1,1s^2+(8k+1)s+3,2k}}$$

$\Delta(s) = 0,1s^3+1,1s^2+(8k+1)s+3,2k = a_3s^3+a_2s^2+a_1s+a_0$

Sunt impuse condițiile necesare:

$a_3 = 0,1>0$

$a_2 = 1,1>0$

$a_1 = 8k+1>0 \Rightarrow k>-0,125 \Rightarrow k\in(-0,125;+\infty)$

$a_0 = 3,2k>0 \Rightarrow k\in(0;+\infty)$

$\Rightarrow \boxed{k\in(0;+\infty)(*)}$

$$n=3 \Rightarrow H=\begin{bmatrix} a_2 & a_0 & 0 \\ a_3 & a_1 & 0 \\ 0 & a_2 & a_0 \end{bmatrix} = \begin{bmatrix} 1,1 & 3,2k & 0 \\ 0,1 & 8k+1 & 0 \\ 0 & 1,1 & 3,2k \end{bmatrix}$$

Sunt impuse condițiile suficiente:

$\det(H_1) = 1,1>0$

$\det(H_2) = 1,1(8k+1)-0,32k = 8,8k+1,1-0,32k = 8,48k+1,1>0 \Rightarrow$

$k>-0,1297 \Rightarrow k\in(-0,1297;+\infty)$

$\det(H) = a_0\det(H_2) = 3,2k(8,48k+1,1)>0 \Rightarrow k\in(0;+\infty)\cap(-0,1297;+\infty)$

$\Rightarrow k\in(0;+\infty)$

$\Rightarrow k\in(0;+\infty)\cap(-0,1297;+\infty) \Rightarrow \boxed{k\in(0;+\infty)(**)}$

Din $(*)$ și $(**)$ $\Rightarrow \boxed{k\in(0;+\infty)}$

$\Rightarrow$

$k_r = H_{z,r}(0) = \frac{3200k}{3,2k} = 1000 \Rightarrow \boxed{k_r=1000}$

$k_d = H_{z,d}(0) = 0 \Rightarrow \boxed{k_d=0}$

6) $\Delta(z) = z^3-2z^2+(1,3-b)z-0,1 = a_3z^3+a_2z^2+a_1z+a_0$

$a_3=1$

$a_2=-2$

$a_1=1,3-b$

$a_0=-0,1$

- cu $n=3$ și $a_3=1>0$

Sunt testate primele 3 condiții de stabilitate:

$\Delta(1) = 1-2+(1,3-b)-0,1 = -1+1,3-b-0,1 = 0,2-b>0 \Rightarrow b<0,2 \Rightarrow$ $\boxed{b\in(-\infty;0,2)\ (*)}$

$\Delta(-1) = -1-2-(1,3-b)-0,1 = -3,1-1,3+b = b-4,4<0 \Rightarrow b<4,4 \Rightarrow$ $\boxed{b\in(-\infty;4,4)\ (**)}$

$a_0=-0,1 \Rightarrow |a_0|=0,1<a_3$ A.

$$b_0 = \begin{vmatrix} a_0 & a_3 \\ a_3 & a_0 \end{vmatrix} = \begin{vmatrix} -0,1 & 1 \\ 1 & -0,1 \end{vmatrix} = (-0,1)^2-1 = 0,01-1 = -0,99$$

$$b_1 = \begin{vmatrix} a_0 & a_2 \\ a_3 & a_1 \end{vmatrix} = \begin{vmatrix} -0,1 & -2 \\ 1 & 1,3-b \end{vmatrix} = -0,1(1,3-b)+2 = -0,13+0,1b+2 = 0,1b+1,87.$$

$$b_2 = \begin{vmatrix} a_0 & a_1 \\ a_3 & a_2 \end{vmatrix} = \begin{vmatrix} -0,1 & 1,3-b \\ 1 & -2 \end{vmatrix} = 0,2-1,3+b = b-1,1.$$

Linie	z^0	z^1	z^2	z^3
(1)	$-0,1$ (a_0)	$1,3-b$ (a_1)	-2 (a_2)	1 (a_3)
(2)	1 (a_3)	-2 (a_2)	$1,3-b$ (a_1)	$-0,1$ (a_0)
(3)	$-0,99$ (b_0)	$0,1b+1,87$ (b_1)	$b-1,1$ (b_2)	—
(4)	$b-1,1$ (b_2)	$0,1b+1,87$ (b_1)	$-0,99$ (b_0)	—

$|b_0|>|b_2| \Rightarrow$

$0,99>1,1-b \Rightarrow$

$b>1,1-0,99$

$b>0,11 \Rightarrow$

$\boxed{b\in(0,11;+\infty)\ (***)}$

$|b_0| = 0,99$

$|b_2| = |b-1,1| = |-(1,1-b)| = 1,1-b$

Din $(*)$, $(**)$ și $(***) \Rightarrow$

$b\in(-\infty;0,2)\cap(-\infty;4,4)\cap(0,1$

$\Rightarrow \boxed{b\in(0,11;0,2)}$