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

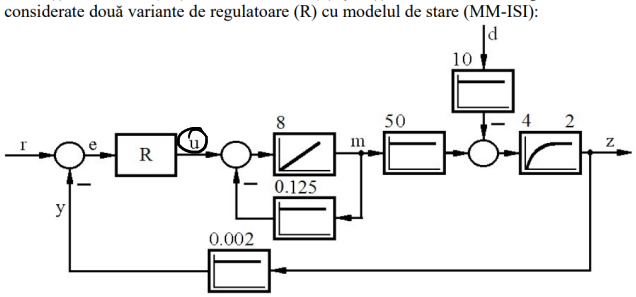

Fig. 1. Schema bloc a sistemului de reglare automată.

- rândul 1:

$$\dot{x}_1(t) = \frac{e(t)}{T_1} - \frac{x_1(t)}{T_2}, \qquad (1)$$
$$u(t) = c_1(x_1(t) + e(t)),$$

- rândul 2:

$$\dot{x}_1(t) = -\frac{x_1(t)}{T_2} + \frac{T_2 - T_1}{T_2} e(t), \qquad (2)$$
$$u(t) = \frac{c_1}{T_2}(T_1 e(t) + x_1(t)).$$

u ieșire R
e - intrare R

R_1: $\dot{x}_1(t) = \frac{e(t)}{T_1} - \frac{x_1(t)}{T_2}$ $\qquad x^{(m)}(t) = s^m x(s)$

$$s \cdot x_1(s) = \frac{e(s)}{T_1} - \frac{x_1(s)}{T_2}$$

$$x_1(s)\left[T_2 s + \frac{1}{T_2}\right] = \frac{e(s)}{T_1}$$

$$x_1(s) = e(s) \cdot \frac{T_2}{T_1(1+sT_2)}$$

$$u(t) = c_1(x_1(t) + e(t))$$

$$u(s) = c_1 e(s)\left[\frac{T_2}{T_1(1+sT_2)} + 1\right]$$

$$H(s) = \frac{u(s)}{e(s)} = c_1\left[\frac{T_2}{T_1(1+sT_2)} + 1\right] \qquad T_1 = 2{,}5 \text{ sec}, \quad T_2 = 0{,}1 \text{ sec}$$

$$= c_1 \cdot \frac{0{,}1 + 2{,}5(1 + 0{,}1s)}{2{,}5(1 + 0{,}1 \cdot s)} =$$

$$= c_1 \cdot \frac{2{,}6 + 0{,}25s}{2{,}5(1+0{,}1s)} \longrightarrow \text{PD - controller / PDT1 ??}$$

$$= C_1 \cdot \frac{1,04 + 0,1\,s}{1 + 0,1\,s} =$$

$$= \boxed{C_1 \cdot 1,04} \cdot \frac{1 + 0,96\,s}{1 + 0,1\,s} \longrightarrow \text{PbT}_1$$

k_R

$$R_2: \dot{x}_1(t) = -\frac{x_1(t)}{T_2} + \frac{T_2 - T_1}{T_2} e(t)$$

$$x_1(s)\left[\frac{T_2}{s} + \frac{1}{T_2}\right] = \frac{T_2 - T_1}{T_2} e(t)$$

$$x_1(s) = \frac{T_2 - T_1}{T_2} \cdot \frac{T_2}{1 + sT_2} e(t)$$

$$x_1(s) = \frac{T_2 - T_1}{1 + sT_2} e(t)$$

$$u(t) = \frac{C_1}{T_2}\left[T_1 e(t) + x_1(t)\right]$$

$$u(s) = \frac{C_1}{T_2} e(s)\left[T_1 + \frac{T_2 - T_1}{1 + sT_2}\right] =$$

$$= \frac{C_1}{T_2} e(s) \frac{T_1 + sT_1T_2 + T_2 - T_1}{1 + sT_2} =$$

$$= e(s) \frac{C_1}{T_2} T_2 \frac{1 + sT_1}{1 + sT_2} =$$

$$= e(s)\, C_1 \cdot \frac{1 + sT_1}{1 + sT_2}$$

$T_1 = 2,5$ sec

$T_2 = 0,1$ sec

$$H(s) = \frac{u(s)}{e(s)} = c_1 \cdot \frac{1 + 2{,}5\,s}{1 + 0{,}1\,s} \longrightarrow \text{PDT1}$$