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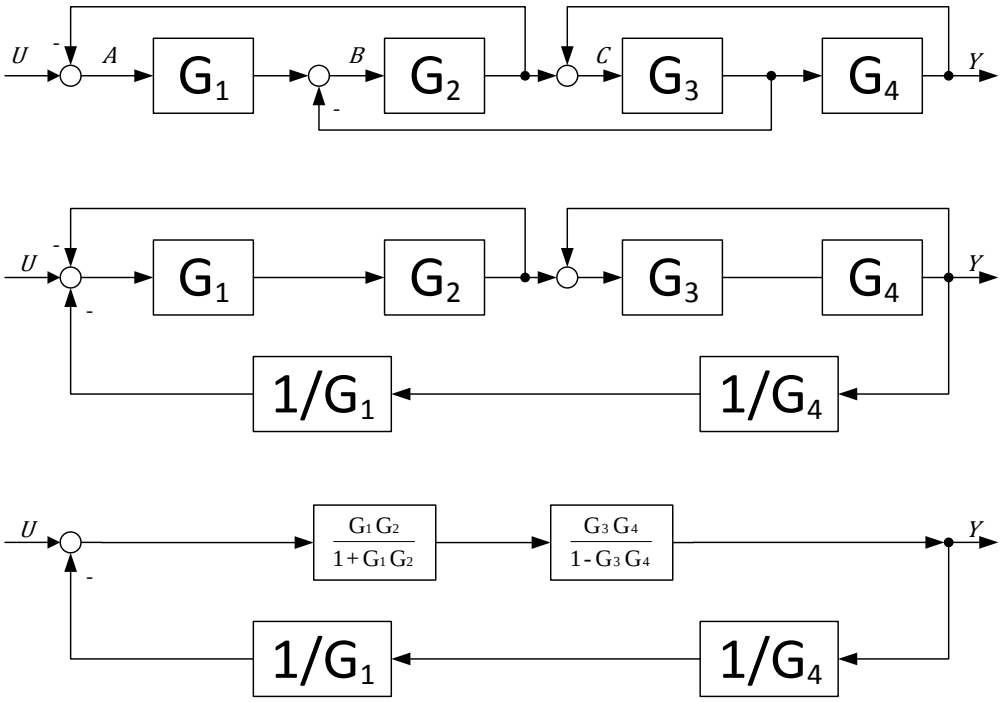
Übung 7 - Lösung

Lösung Aufgabe 1. Lösung durch Umformung:



$$G = \frac{Y}{U} = \frac{G_1 G_2 G_3 G_4}{(1 + G_1 G_2)(1 - G_3 G_4) + G_2 G_3}$$

Algebraischer Ansatz:

$$Y = G_4 G_3 C \tag{1}$$
$$C = Y + G_2 B \tag{2}$$
$$B = -G_3 C + G_1 A \tag{3}$$
$$A = -G_2 B + U \tag{4}$$

(4) in (3) und Auflösen nach B:

$$B = -\frac{G_3}{1 + G_1 G_2} C + \frac{G_1}{1 + G_1 G_2} U \tag{5}$$

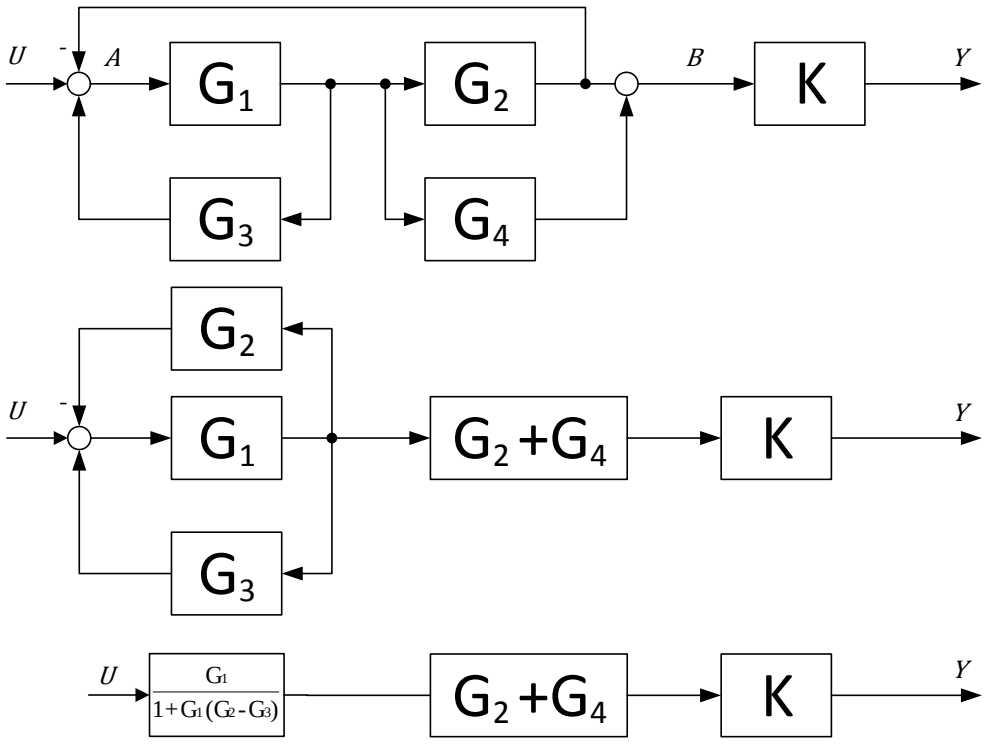
(5) in (2) und Auflösen nach C:

$$C = \frac{1 + G_1 G_2}{1 + G_1 G_2 + G_2 G_3} Y + \frac{G_1 G_2}{1 + G_1 G_2 + G_2 G_3} \tag{6}$$

(6) in (1) und Auflösen nach Y:

$$G = \frac{Y}{U} = \frac{G_1 G_2 G_3 G_4}{(1 + G_1 G_2)(1 - G3 G_4) + G_2 G_3}$$

Lösung Aufgabe 2. Lösung durch Umformung:



$$G = \frac{Y}{U} = \frac{K G_1 (G_2 + G_4)}{1 + G_1 (G_2 - G_3)}$$

Algebraischer Ansatz:

$$Y = KB \tag{1}$$
$$B = G_1 (G_2 + G_4) A \tag{2}$$
$$A = G_1 (-G_2 + G_3) A + U \tag{3}$$

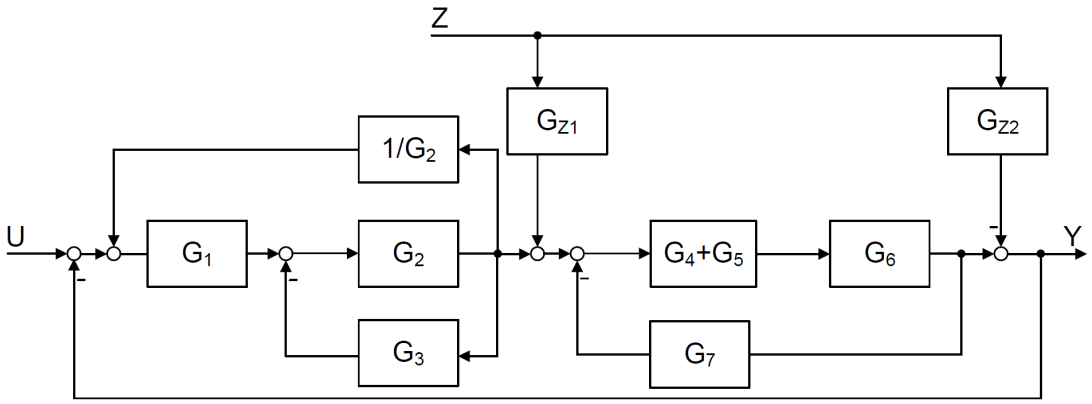
(3) Auflösen nach A:

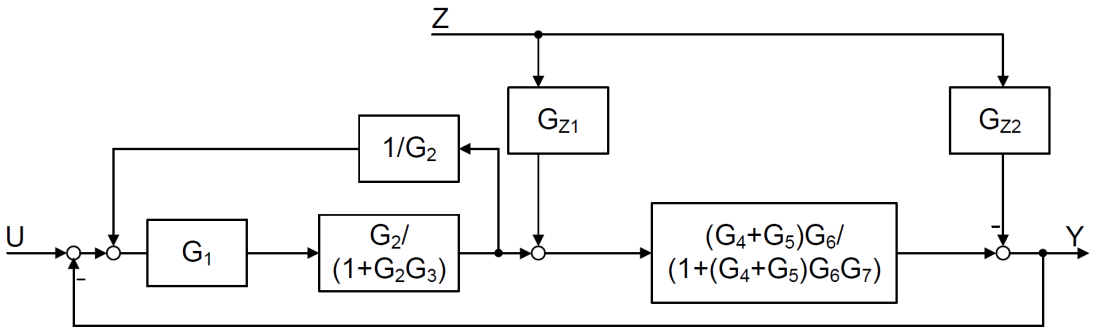
$$A = \frac{1}{1 + G_1(G_2 - G_3)} U \tag{4}$$

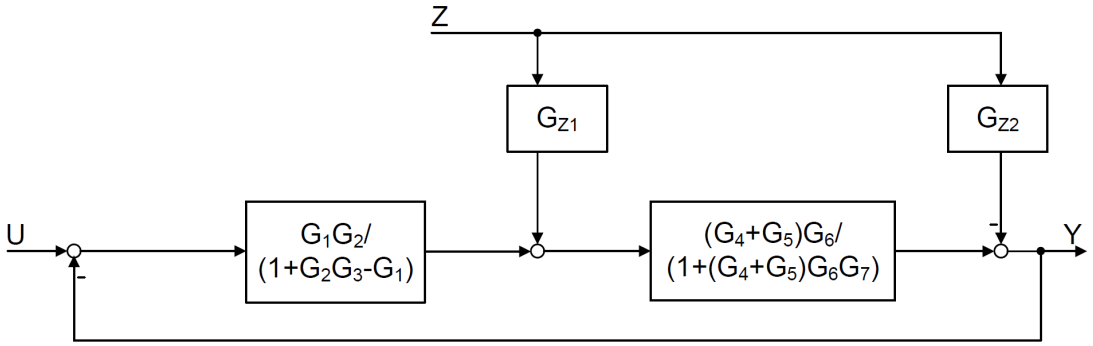
(2) und (4) in (1)

$$G = \frac{Y}{U} = \frac{K G_1 (G_2 + G_4)}{1 + G_1(G_2 - G_3)} U$$

Lösung Aufgabe 3. Lösung durch Umformung:







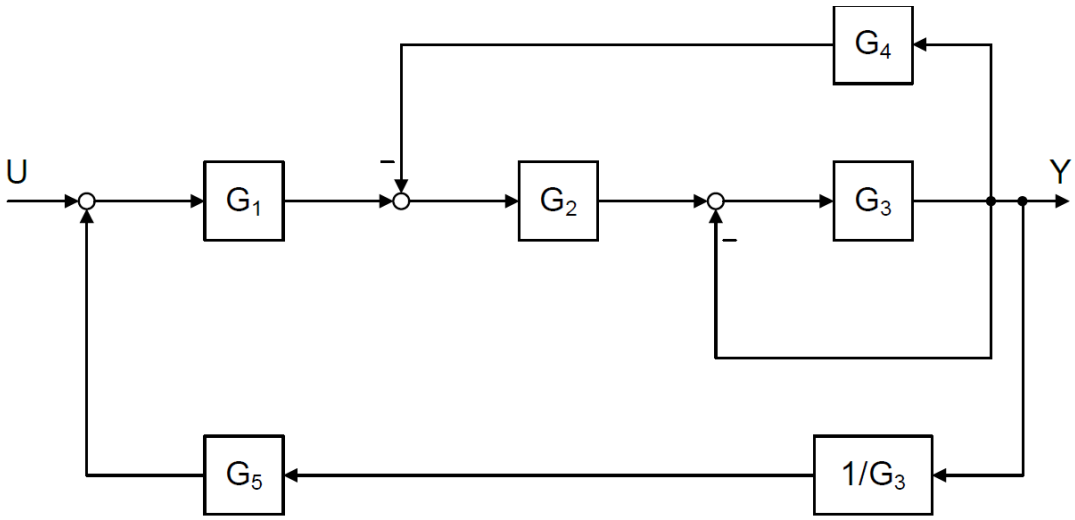
Es gilt: $Y = G \cdot U + G_Z \cdot Z$. Berechnung von $G = \dfrac{Y}{U}$ für $Z = 0$:

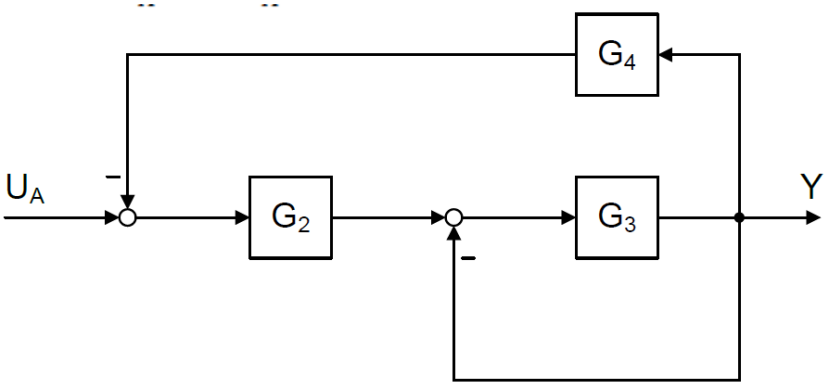
$$\begin{aligned} G &= \frac{\dfrac{G_1 G_2}{1 + G_2 G_3 - G_1} \cdot \dfrac{(G_4 + G_5) G_6}{1 + (G_4 + G_5) G_6 G_7}}{1 + \dfrac{G_1 G_2}{1 + G_2 G_3 - 1} \cdot \dfrac{(G_4 + G_5) G_6}{1 + (G_4 + G_5) G_6 G_7}} \\ &= \frac{G_1 G_2 (G_4 + G_5) G_6}{(1 + G_2 G_3 - G_1) \cdot (1 + (G_4 + G_5) G_6 G_7) + G_1 G_2 (G_4 + G_5) G_6} \end{aligned}$$

Berechnung von $G_Z = \dfrac{Y}{Z} \rightarrow U = 0$:

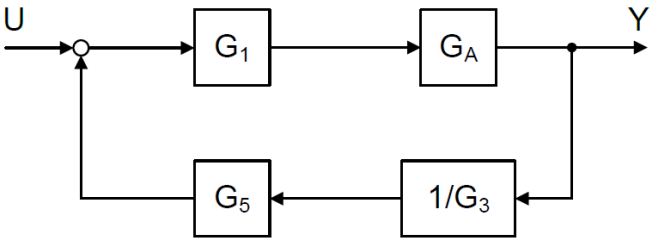
$$G_Z = \frac{G_{Z1} \cdot \dfrac{(G_4 + G_5)G_6}{1 + (G_4 + G_5)G_6G_7} - G_{Z2}}{1 + \left(G_{Z1} \cdot \dfrac{(G_4 + G_5)G_6}{1 + (G_4 + G_5)G_6G_7} - G_{Z2} \right) \dfrac{G_1G_2}{1 + G_2G_3 - G_1}}$$

Lösung Aufgabe 4. Lösung durch Umformung:
Berechnen von $G_A = \dfrac{Y}{U_A}$:





$$G_A = \frac{Y}{U_A} = \frac{G_2 \cdot \dfrac{G_3}{1 + G_3}}{1 + G_2G_4 \cdot \dfrac{G_3}{1 + G_3}} = \frac{G_2G_3}{1 + G_3 + G_2G_3G_4} \tag{1}$$



$$G = \frac{Y}{U} = \frac{G_1 G_A}{1 - \dfrac{G_1 G_A G_5}{G_3}} = \frac{G_1 G_2 G_3}{1 + G_3 + G_2 G_3 G_4 - G_1 G_2 G_5}$$