PROIECT SACAP

1. Prezentarea schemei bloc funcționale aferentă SA-m.c.c. (Fig. B-1.1). Prezentarea MM aferente S.A.-m.c.c. (MM-II și MM-ISI) concretizate cu valorile numerice ale parametrilor; acestea se determină pe baza datelor numerice specifice (prezente în fișierul "Date numerice proiect tema nr. 1 ").

B. Descrierea obiectivelor conducerii. 1. ***Schema bloc funcțională aferenta unui SCA cu m.c.c.*** este prezentată în fig.B-1.1. Semnificația mărimilor care apar:

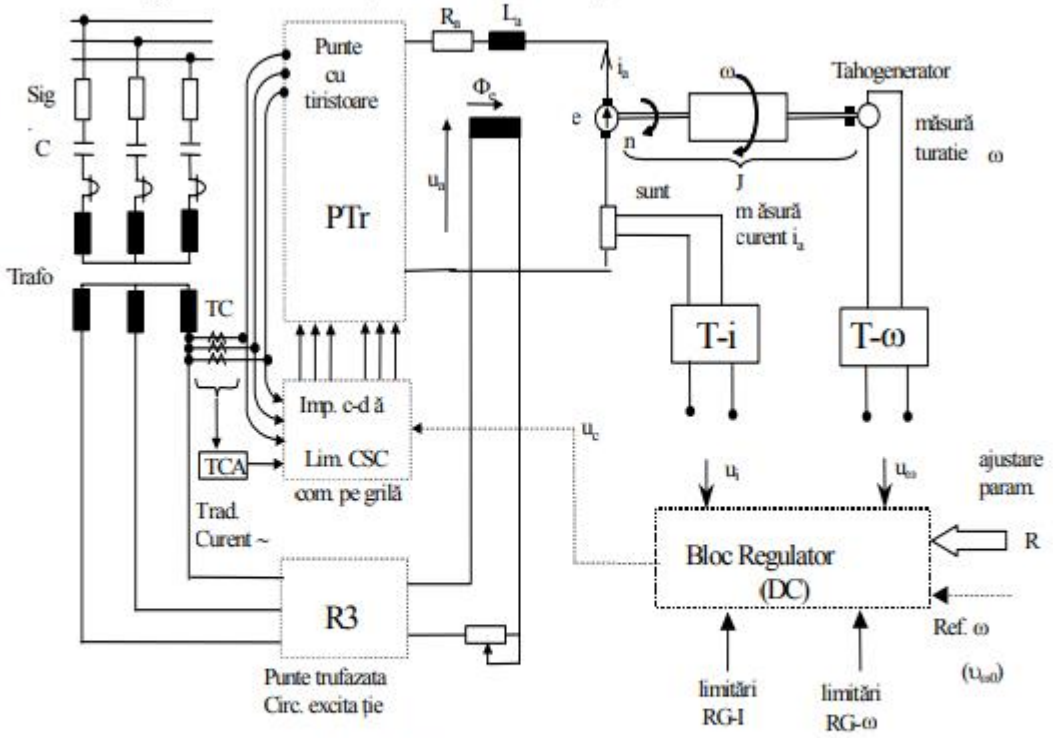


Fig.B-1.1. *Schema bloc funcțională aferenta unui SA- m.c.c.*

ω - viteza unghiulară; m – moment / cuplu activ; u_ω - măsura vitezei unghiulare ω;
u_a – tensiunea de alimentare; m_s – moment de sarcină; m_f – moment de frecări.
u_c – tensiunea de comanda; e – tensiune contra-electromotoare;
I_a – curentul prin indus; u_i – măsura curentului I_a .

Nr.crt	P_{an}	u_{an}	i_{an}	η	η_n	ω_{an}	T_a	R_a	T_m	u_{cn}	J	k_E
U.M.	W	V	A	---	Rot/min	Rad/sec	Sec	Ω	Sec	V	Nm2	V/V
Valoare	1000	150	6.67	0.83	2500	261.5	0.09	3.24	0.7	3.5	0.051	42.85

$$i_{an} = \frac{p_{an}}{u_{an}}$$

= 1000/150 = 6.67 A

$$\omega_n = \frac{2\pi}{60} n_n = 0.1046 \cdot n_n$$

= 0.1046*2500 = 261.5 Rad/sec

$$k_E = \frac{u_{an}}{u_{cn}}$$

=150/3.5=42.85

$$m_n = \eta \cdot \frac{p_{an}}{0{,}97 \cdot \omega_{an}}$$

=3.27

$$e_n = \frac{m_n \cdot \omega_n}{i_{an}}$$

= (3.27*261.5)/6.67 = 128.2 V

$$k_m = \frac{m_n}{i_{an}}$$

= 3.27/6.67 = 0.49

$$k_e = \frac{e_n}{\omega_n}$$

= 128.2/261.5 = 0.49

$$\Delta u = u_{an} - e_n$$

= 150 – 128.2 = 21.8V

$$R_a = \frac{\Delta u}{i_{an}}$$

= 21.8/6.67 = 3.24 Ω

$$J = \frac{k_m \cdot k_e}{R_a} T_m$$

= 0.49*0.49*0.7/3.24 = 0.051 N*m^2

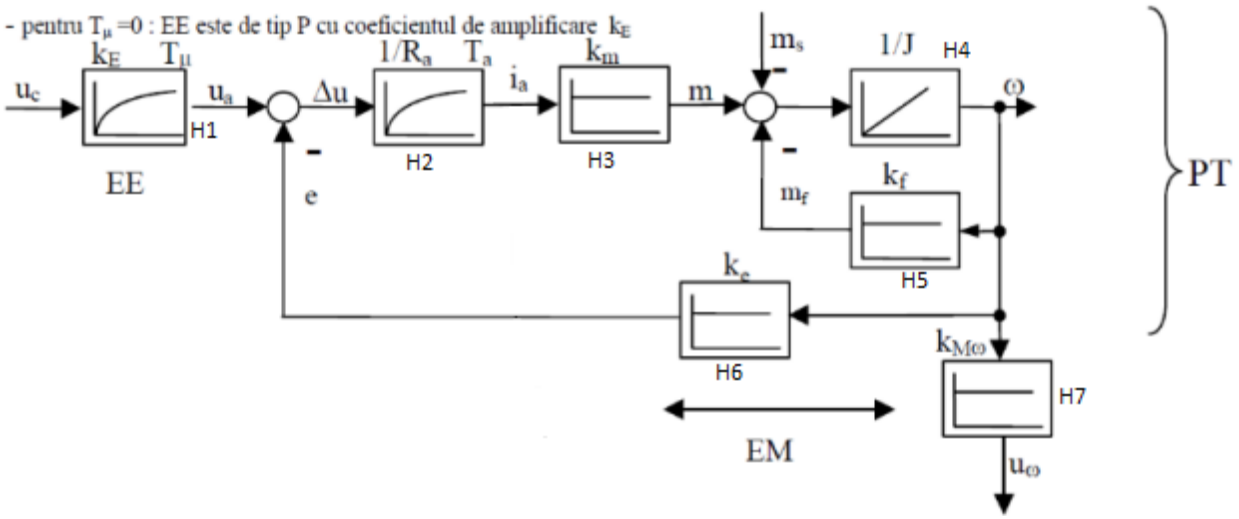
$$k_{M\omega} = \frac{5}{\omega_n} V/rads^{-1}$$

= 0.019 V/rads ^ (-1)

$$k_{Mi} = \frac{3{,}5}{i_{an}} V/A$$ = 0.52 V/A

kf = 0.001

	e_n	Δu	ω_n	k_m	k_e	m_n	T_m	k_{Mi}	$K_{M\omega}$
UM	V	V	$rads^{-1}$	Nm/A	$V/rads^{-1}$	Nm	sec	V/A	$V/rads^{-1}$
Valoare	128.2	21.8	261.5	0.49	0.49	3.27	0.7	0.52	0.019



MM-ISI

$$\begin{bmatrix}\dot{x}_1\\ \dot{x}_2\\ \dot{x}_3\end{bmatrix}=\begin{bmatrix}\frac{-1}{T_a} & \frac{-k_e}{L_a} & \frac{1}{L_a}\\ \frac{k_e}{J} & \frac{-k_f}{J} & 0\\ 0 & 0 & \frac{-1}{T_\mu}\end{bmatrix}\begin{bmatrix}x_1\\ x_2\\ x_3\end{bmatrix}+\begin{bmatrix}0 & 0\\ 0 & \frac{-1}{J}\\ \frac{k_E}{T_\mu} & 0\end{bmatrix}\begin{bmatrix}u_c\\ m_s\end{bmatrix},$$

unde:

$x_1 = i_a$, $x_2 = \omega$, $x_3 = u_a$ și Tμ=0 =>

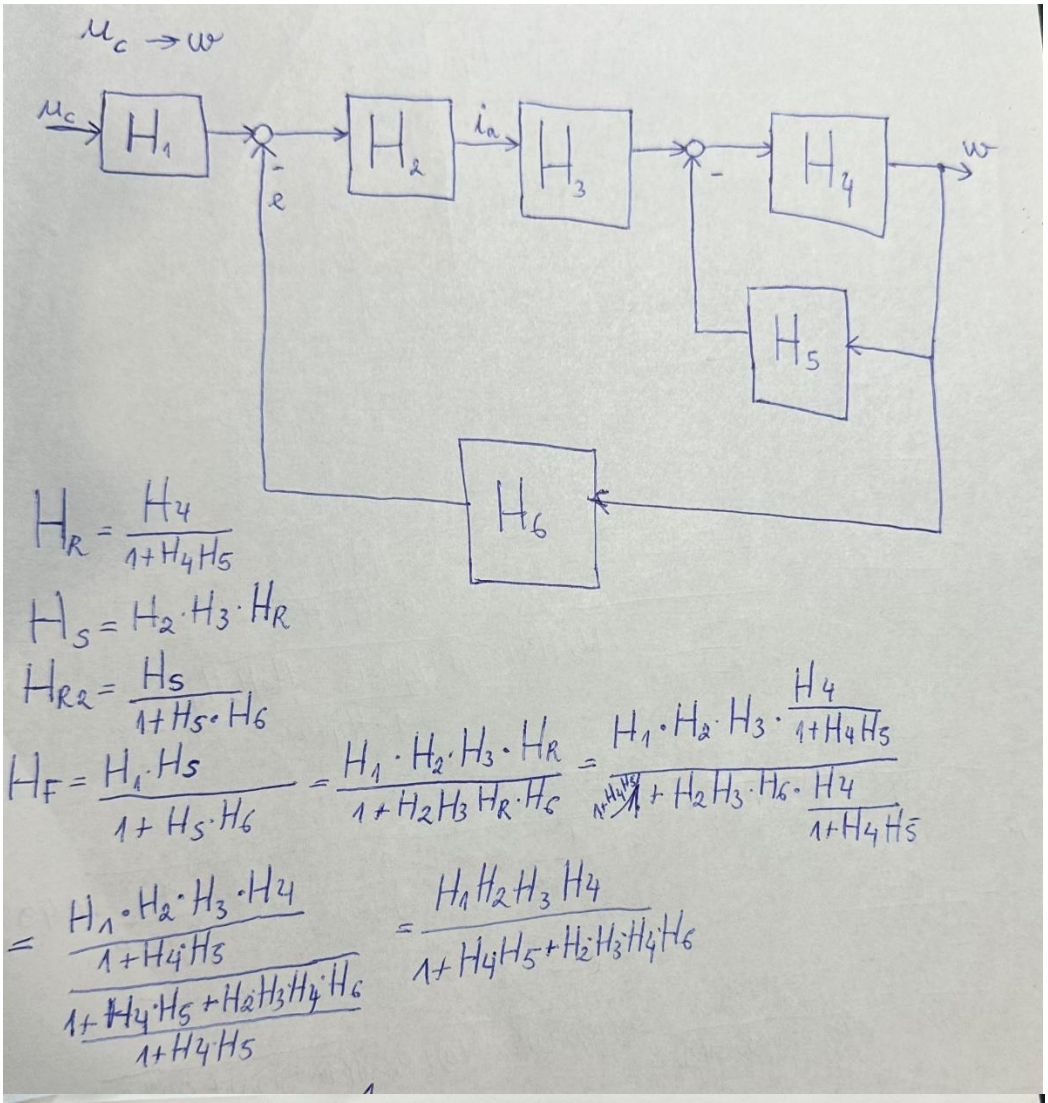
$$\begin{bmatrix}i_a\\ \omega\end{bmatrix}=\begin{bmatrix}1 & 0 & 0\\ 0 & 1 & 0\end{bmatrix}\begin{bmatrix}x_1\\ x_2\\ x_3\end{bmatrix}$$

$u_i = k_{Mi}\, i_a$, $u_\omega = k_{M\omega}\omega$

MM-II

H1= kE/(1+Tμ*s) = 42.85
H2= (1/Ra)/(1+Ta*s) = 0.3/(1+0.09*s)
H3= km = 0.49

H4= 1/(1/J*s) = 1/(0.051*s)
H5= kf = 0.001
H6= ke = 0.49
H7= Kmω = 0.01
u_c-> ω



$$H_R = \frac{H_4}{1+H_4H_5}$$

$$H_S = H_2 \cdot H_3 \cdot H_R$$

$$H_{R2} = \frac{H_S}{1+H_S \cdot H_6}$$

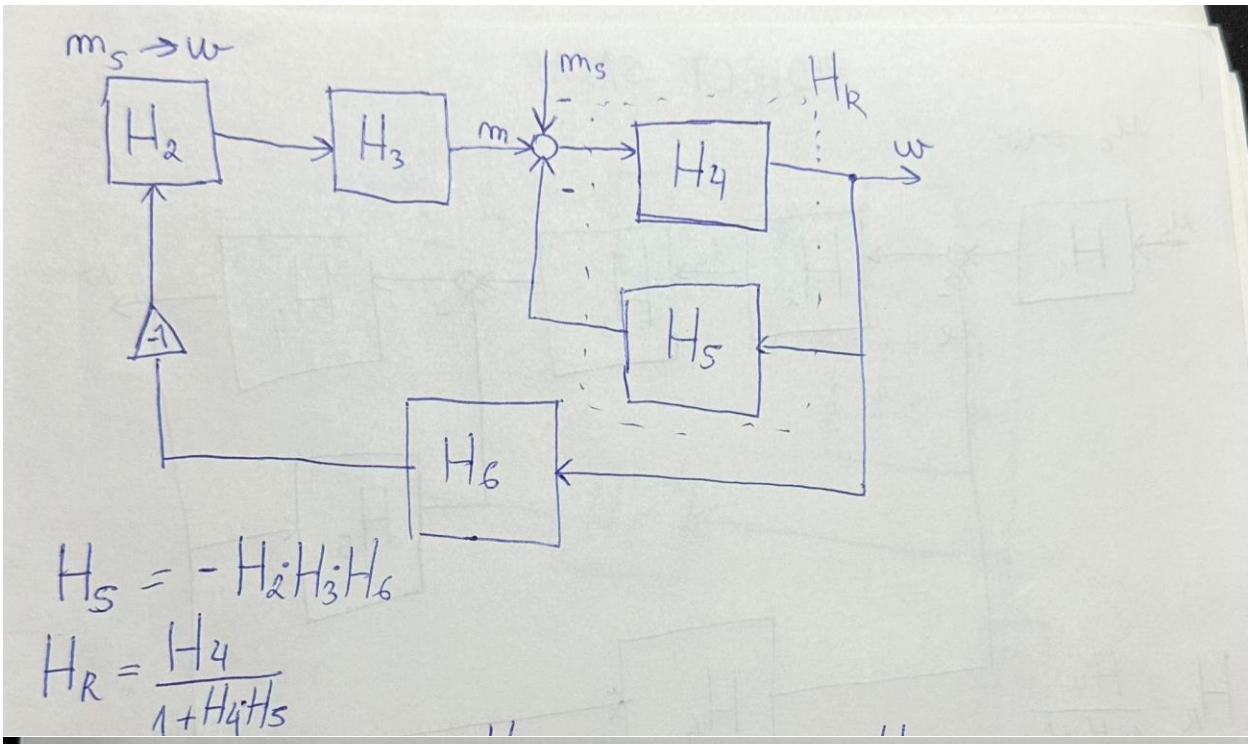
$$H_F = \frac{H_1 \cdot H_S}{1+H_S \cdot H_6} = \frac{H_1 \cdot H_2 \cdot H_3 \cdot H_R}{1+H_2H_3H_R \cdot H_6} = \frac{H_1 \cdot H_2 \cdot H_3 \cdot \frac{H_4}{1+H_4H_5}}{1+H_2H_3 \cdot H_6 \cdot \frac{H_4}{1+H_4H_5}}$$

$$= \frac{\frac{H_1 \cdot H_2 \cdot H_3 \cdot H_4}{1+H_4H_5}}{\frac{1+H_4H_5+H_2H_3H_4H_6}{1+H_4H_5}} = \frac{H_1H_2H_3H_4}{1+H_4H_5+H_2H_3H_4H_6}$$

$$H_F = \frac{42{,}85 \cdot \frac{0{,}3}{1+0{,}09\Delta} \cdot 0{,}49 \cdot \frac{1}{0{,}051\Delta}}{1+\frac{1}{0{,}051\Delta} \cdot 0{,}001 + \frac{0{,}3}{1+0{,}09\Delta} \cdot 0{,}49 \cdot \frac{1}{0{,}051\Delta} \cdot 0{,}49} \quad \leftarrow u_c \to w$$

$$= \frac{42{,}85 \cdot 0{,}3 \cdot 0{,}49}{0{,}051\Delta \cdot (1+0{,}09\Delta) + 0{,}001 \cdot (1+0{,}09\Delta) + 0{,}072} = \frac{6{,}3}{0{,}00459\Delta^2 + 0{,}052\Delta + 0{,}73}$$

m_S-> ω



$$H_S = -H_2 \cdot H_3 \cdot H_6$$

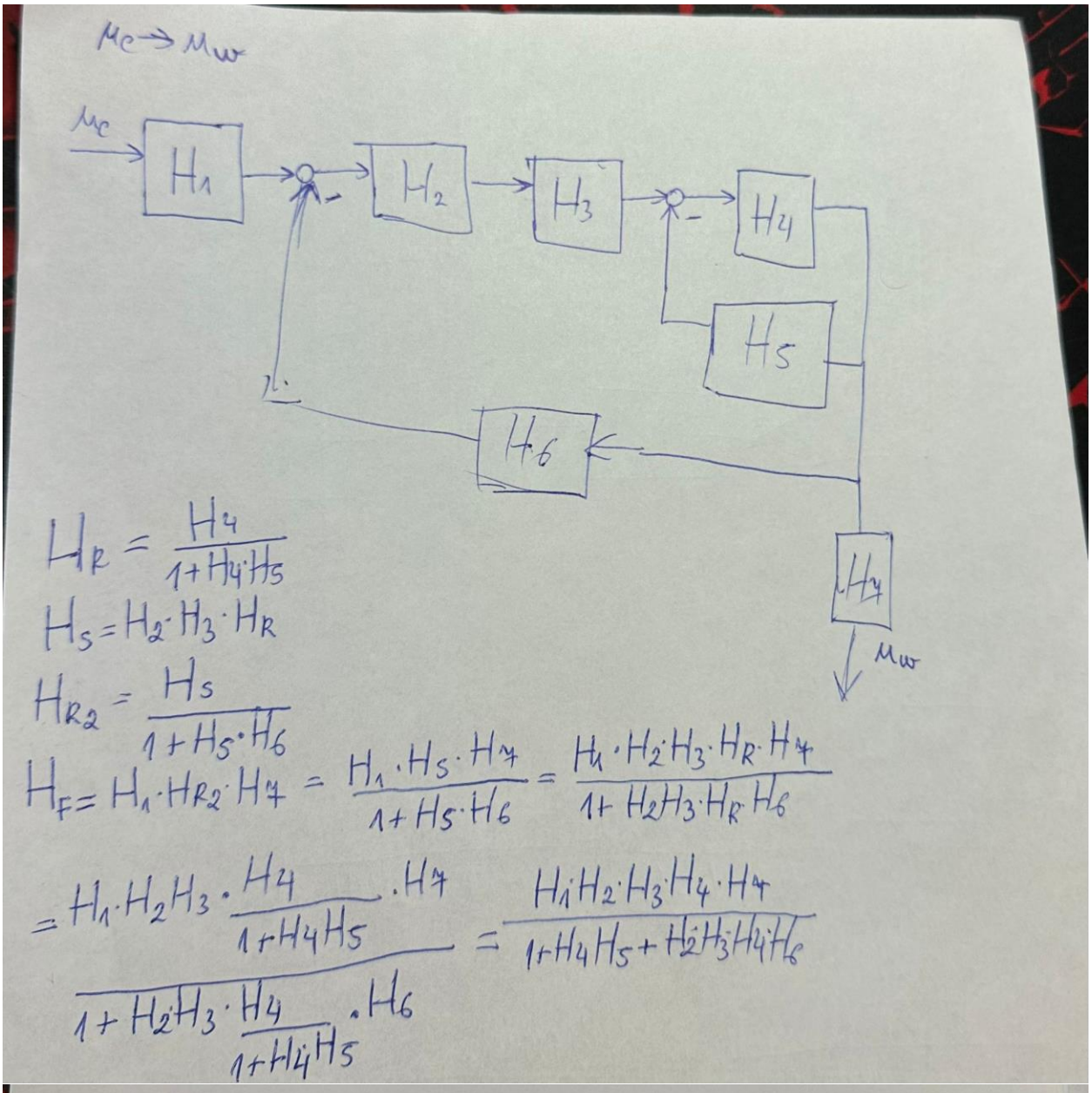
$$H_R = \frac{H_4}{1 + H_4 H_5}$$

$$H_F = \frac{-H_R}{1 - H_R \cdot H_S} = \frac{-\frac{H_4}{1+H_4H_5}}{1 + \frac{H_4}{1+H_4H_5} \cdot H_2 \cdot H_3 \cdot H_6} = \frac{-H_4}{1 + H_4H_5 + H_2 \cdot H_3 \cdot H_4 \cdot H_6} \leftarrow m_S \to w$$

$$H_F = \frac{\frac{-1}{0{,}051 \cdot \Delta}}{1 + \frac{0{,}001}{0{,}051 \cdot \Delta} + \frac{0{,}072}{(1+0{,}09\Delta) \cdot 0{,}051\Delta}} = \frac{-1}{0{,}051\Delta \cdot (1+0{,}09\Delta) + 0{,}001(1+0{,}09\Delta) + 0{,}072}$$

$$H_F = \frac{-1}{0{,}0045\Delta^2 + 0{,}052\Delta + 0{,}73}$$

uc->uω



$$H_R = \frac{H_4}{1+H_4 H_5}$$

$$H_5 = H_2 \cdot H_3 \cdot H_R$$

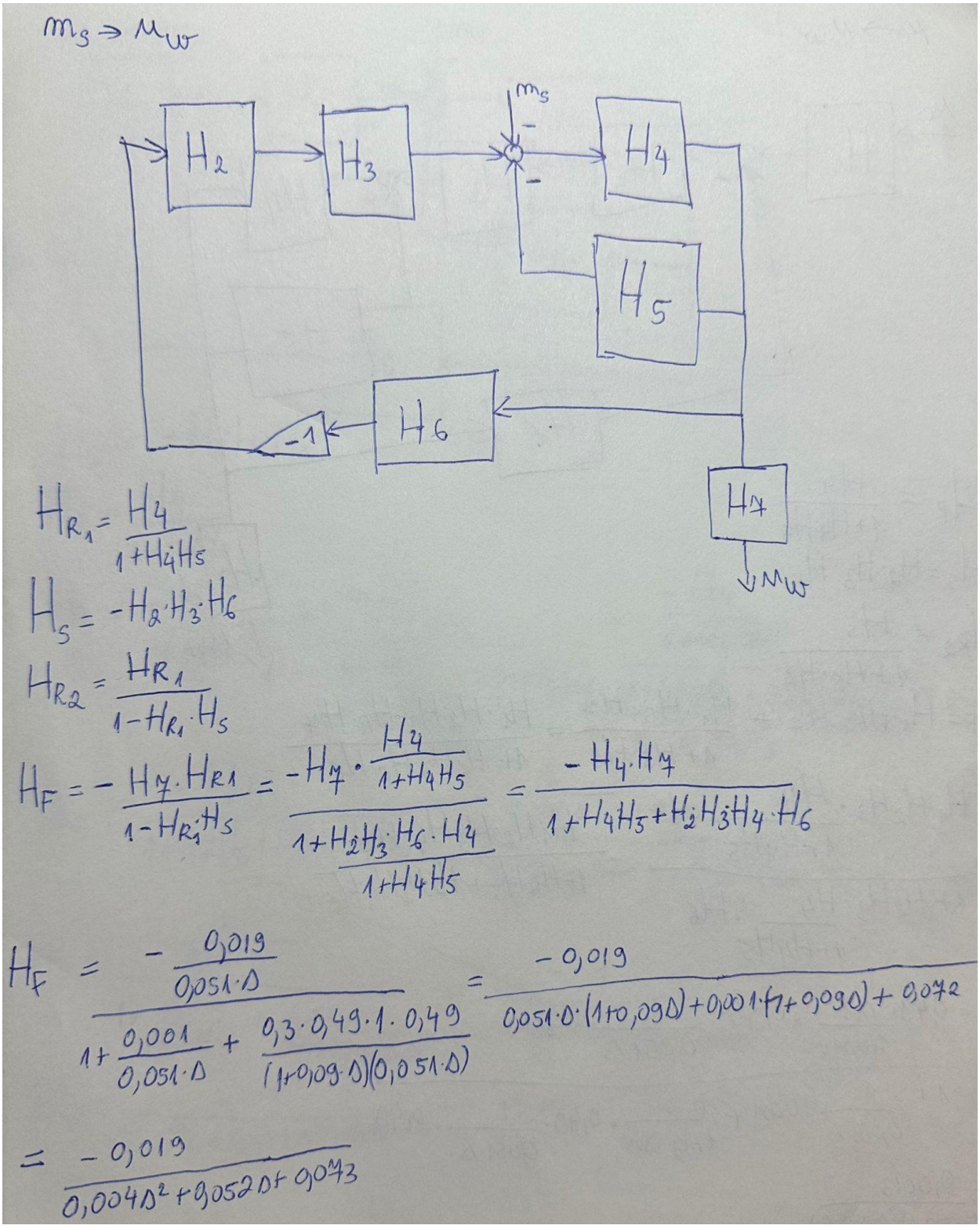
$$H_{R2} = \frac{H_5}{1+H_5 \cdot H_6}$$

$$H_F = H_1 \cdot H_{R2} \cdot H_7 = \frac{H_1 \cdot H_5 \cdot H_7}{1+H_5 \cdot H_6} = \frac{H_1 \cdot H_2 H_3 \cdot H_R \cdot H_7}{1+H_2 H_3 \cdot H_R \cdot H_6}$$

$$= \frac{H_1 \cdot H_2 H_3 \cdot \frac{H_4}{1+H_4 H_5} \cdot H_7}{1+H_2 H_3 \cdot \frac{H_4}{1+H_4 H_5} \cdot H_6} = \frac{H_1 H_2 \cdot H_3 H_4 \cdot H_7}{1+H_4 H_5 + H_2 H_3 H_4 H_6}$$

$$H_F = \frac{42{,}85 \cdot \frac{0{,}3}{1+0{,}09\Delta} \cdot 0{,}49 \cdot \frac{1}{0{,}051\Delta} \cdot 0{,}019}{1 + \frac{1}{0{,}051\Delta} \cdot 0{,}001 + \frac{0{,}3 \cdot 0{,}49 \cdot 0{,}49}{(1+0{,}09\Delta) \cdot 0{,}051\Delta}} = \frac{0{,}119}{0{,}0045\Delta^2 + 0{,}052\Delta + 0{,}073} \leftarrow U_c \rightarrow U_w$$

$m_s \rightarrow u_\omega$



Calcule VRSC pentru PC

Nr.	Intrări (VRSC)		VRSC - CALCULATE								
Crt.	$u_{c\infty}$	$m_{s\infty}$	$u_{g\infty}$	m_{∞}	$m_{f\infty}$	$i_{g\infty}$	e_{∞}	Δu_{∞}	ω_{∞}	$u_{j\infty}$	$u_{\omega\infty}$
1	*0*	*0*	0	0	0	0	0	0	0	0	0
2	U_{cn}	*0*	150	2.94	0.3	0.6	147	2	301	-	5.73
3	U_{cn}	m_{sn}	150	3.5	0.25	7.15	126.1	23.9	257	-	4.88
4	$u_{cn}/2$	*0*	75	1.47	0.150	3	74	1.02	150	-	2.86
5	$u_{cn}/2$	$m_{sn}/2$	75	1.76	0.128	3.6	62.9	12	128	-	2.44