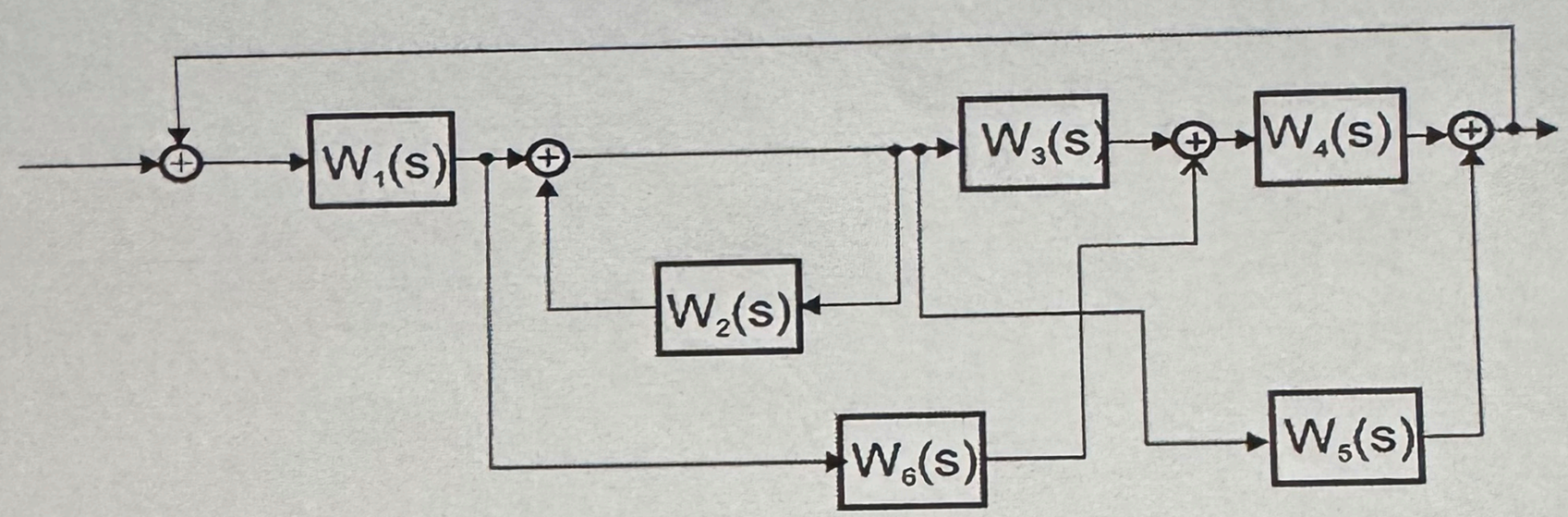
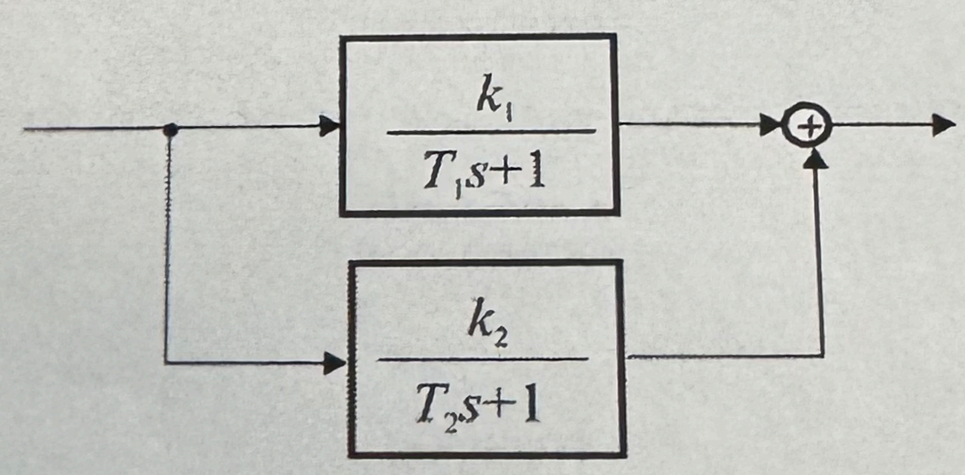
Вариант 7

Задача 1. Определить общую передаточную функцию системы, преобразовав ее структурную схему:

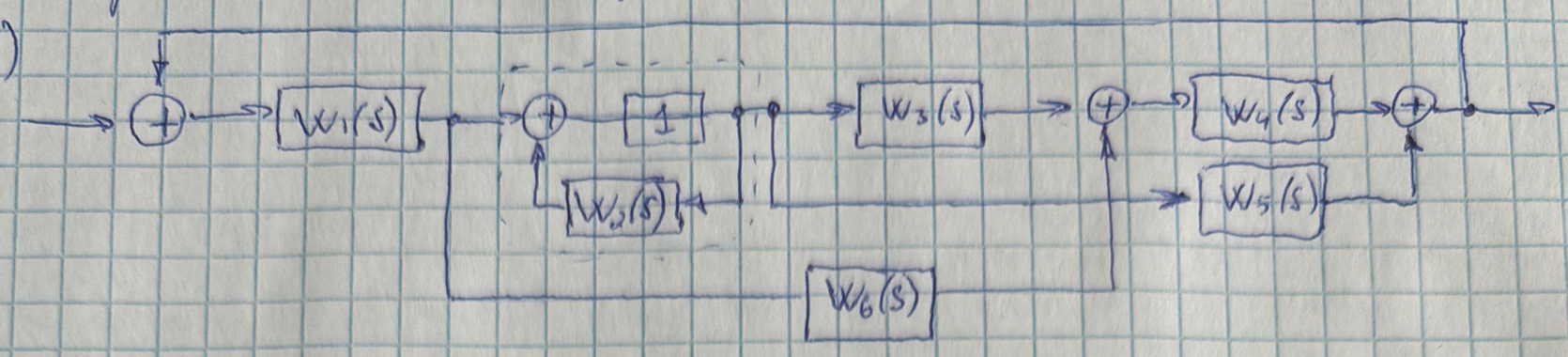


Задача 2. По заданной структурной схеме построить ЛАФЧХ системы, где $k_1 = 100$; $k_2 = 4$; T_1=5с; T_2=0,1с:

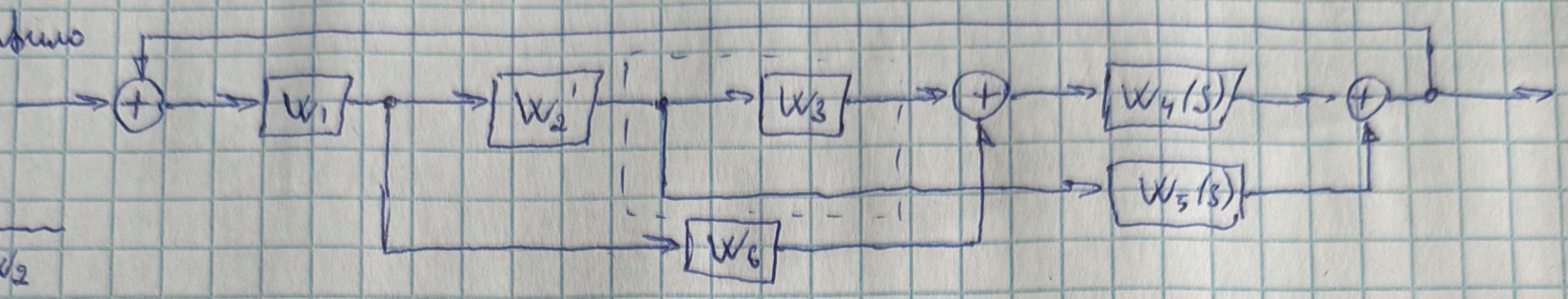


Вариант 7 РК 1 (дополнительно) Давыдов Д. ИУ2-61

№1)

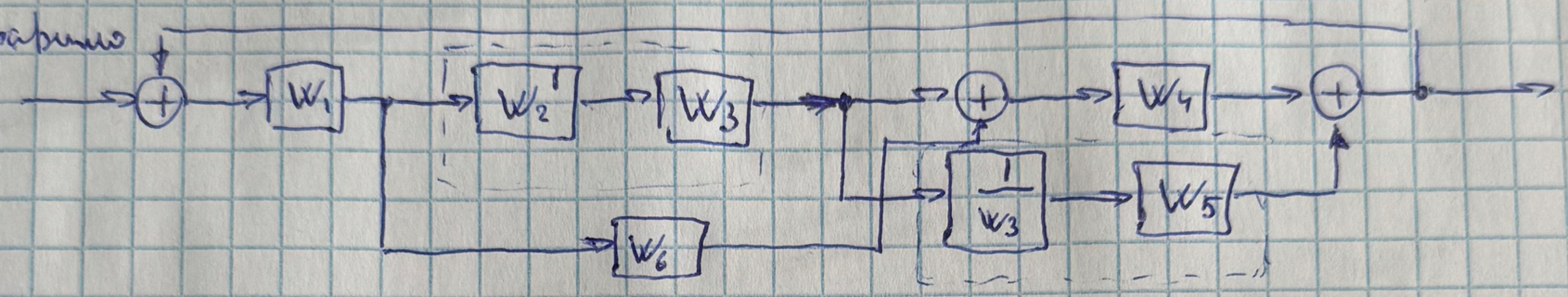


1) 4 правило

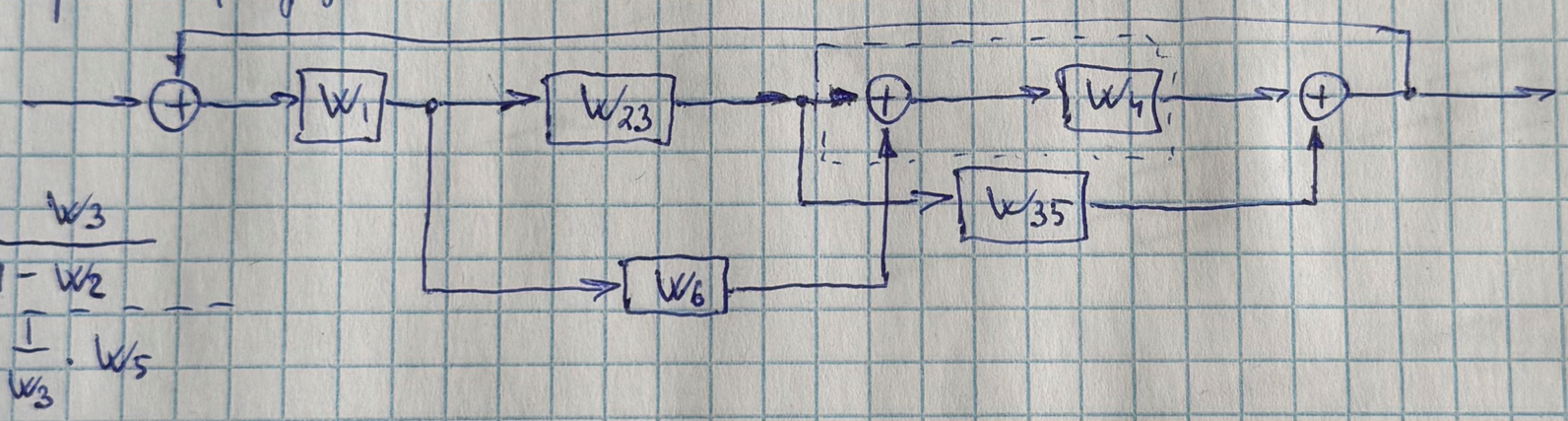


$W_2' = \frac{1}{1 - W_2}$

2) 8 правило



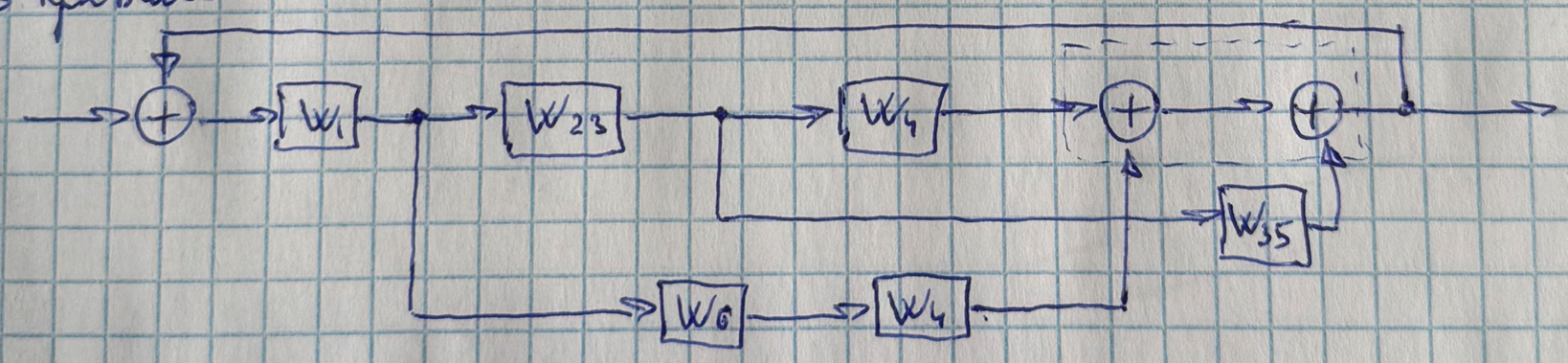
3) 2 правило (в двух местах)



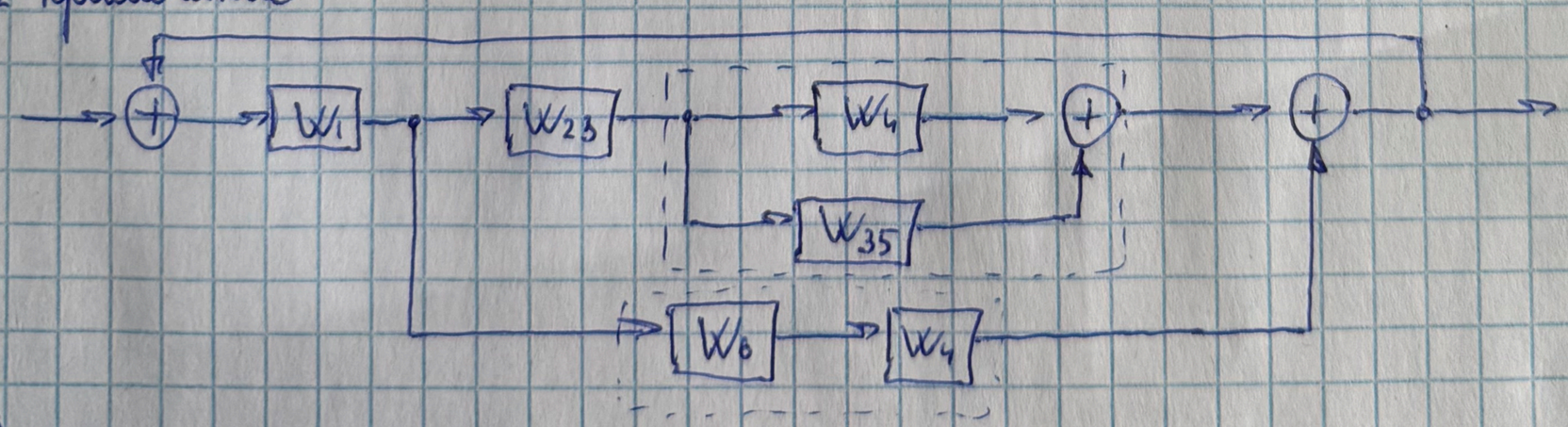
$W_{23} = \frac{W_3}{1 - W_2}$

$W_{35} = \frac{1}{W_3} \cdot W_5$

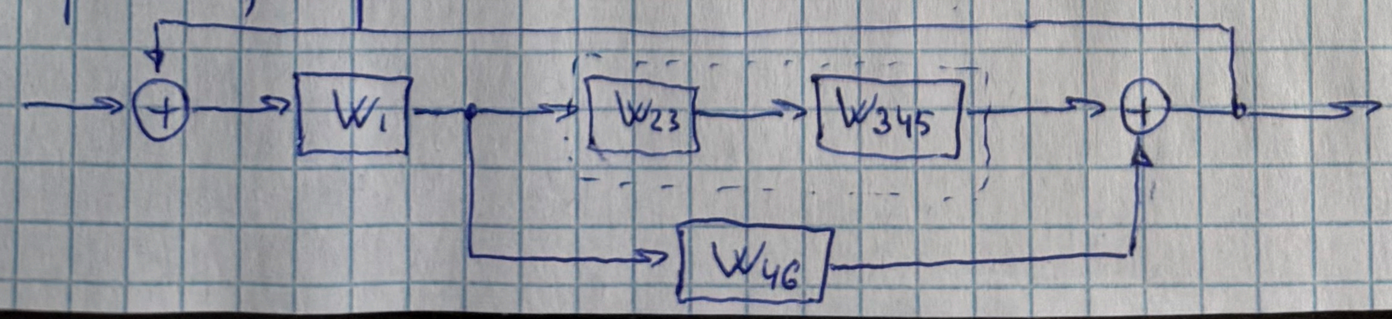
4) 6 правило



5) 1 примечание



6) 3 правило, 2 правило



$W_{345} = W_4 + W_{35} =$

$= W_4 + \frac{W_5}{W_3} = \frac{W_3 \cdot W_4 + W_5}{W_3}$

$W_{46} = W_4 \cdot W_6$

$W_{общ.}(s) =$

$+20 + (-20) = 0$

$0 + 40 = 40$

$(\ldots)\cdot(s)\cdot\left(\frac{1}{T_3 s+1}\right)\cdot\left(T_4^2 s^2 + 2\xi T_4 s + 1\right)^2 = \frac{(0{,}1)s(0{,}1s+1)^2}{(s+1)}$

$K_1 = 0{,}1$

$= \frac{1}{1} = 1$

$= \frac{1}{10} = 0{,}1$

$\varphi_1(\omega) = 0$

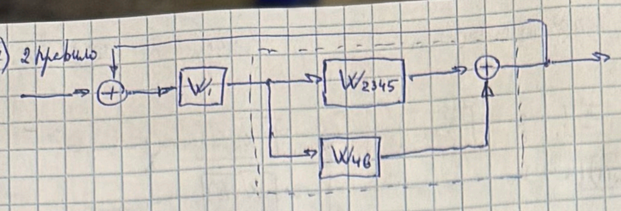
(диф.) ; $\varphi_2(\omega) = +90°$

(инер.) ; $\varphi_3(\omega) : 0 \div -90°$

(реал. диф.) ; $\varphi_4(\omega) = 0 \div 90$

$\lg\omega$

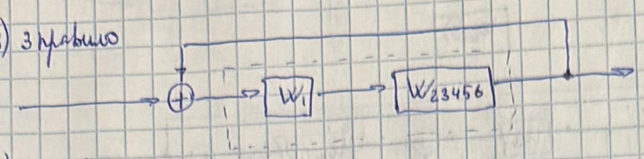
7) 2 правило



$W_{2345} = \frac{W_5}{1-W_2} + \frac{W_3\cdot W_4 + W_5}{W_3} =$

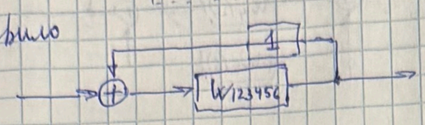
$= \frac{W_3\cdot W_4 + W_5}{1-W_2}$

8) 3 правило



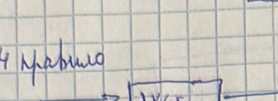
$W_{23456} = \frac{(W_3\cdot W_4 + W_5)}{1-W_2}\cdot W_4\cdot W_6$

9) 2 правило



$W_{123456} = \frac{(W_3 W_4 + W_5)\cdot W_4\cdot W_6\cdot W_1}{1-W_2}$

10) 4 правило

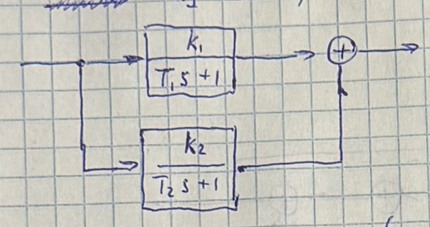


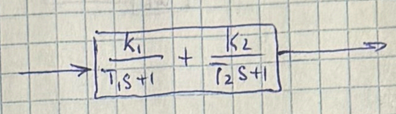
$W_{общ.} = \frac{W_{123456}}{1-W_{123456}} = \frac{\frac{(W_3 W_4 + W_5)\cdot W_4 W_6 W_1}{1-W_2}}{1-\frac{(W_3 W_4 + W_5) W_4\cdot W_6\cdot W_1}{1-W_2}} = \frac{\frac{(W_3 W_4 + W_5) W_4 W_6 W_1}{1-W_2}}{\frac{(1-W_2) - (W_3 W_4 + W_5) W_4\cdot W_6\cdot W_1}{1-W_2}} =$

$= \frac{(W_3 W_4 + W_5) W_4\cdot W_6\cdot W_1}{(1-W_2) - W_1\cdot W_4\cdot W_6 (W_3 W_4 + W_5)}$

Ответ: $W_{общ}(s) = \frac{W_1\cdot W_4\cdot W_6 (W_3 W_4 + W_5)}{(1-W_2) - W_1 W_4\cdot W_6 (W_3 W_4 + W_5)}$

№2) $k_1 = 100$; $k_2 = 4$; $T_1 = 5$ с ; $T_2 = 0{,}1$ с





$W_{общ.}(s) = \frac{100}{5s+1} + \frac{4}{0{,}1s+1} = \frac{100(0{,}1s+1) + 4(5s+1)}{(5s+1)(0{,}1s+1)} = \frac{10s + 100 + 20s + 4}{0{,}5s^2 + 5s + 0{,}1s + 1} = \frac{30s + 104}{0{,}5s^2 + 5{,}1s + 1} =$

$= \frac{\overset{I}{104}\left(\overset{II}{\frac{30}{104}s + 1}\right)}{\underset{III}{0{,}5s^2 + 5{,}1s + 1}}$

I - усил.

II - реал диф 1го порядка

III - колебательное.

I) $W_1(s) = 104$

$A_1(\omega) = 20\lg 104 = 40{,}3$

$\varphi_1(\omega) = 0$

II) $W_2(s) = \frac{30}{104}s + 1$; $W_2(s) = \frac{104}{30}$

$A_2(\omega) : 0, +20$ дб/дек

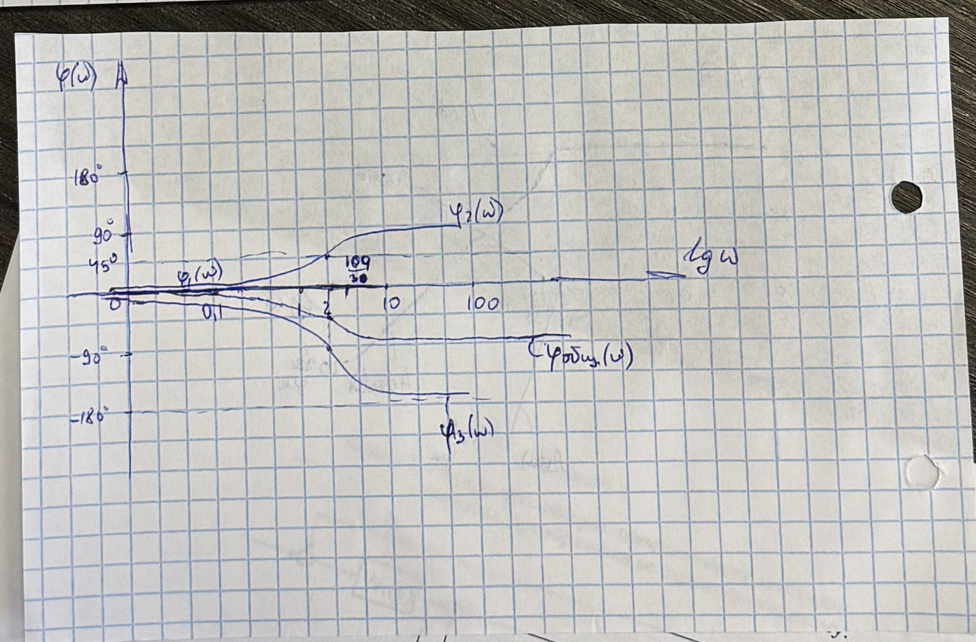
$\varphi_2(\omega) : 0 \div +90°$

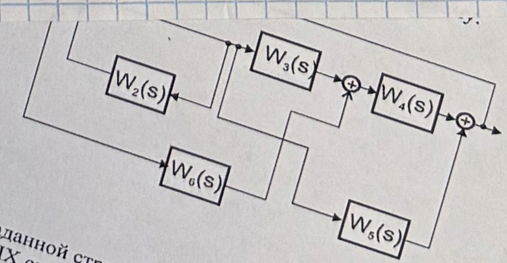
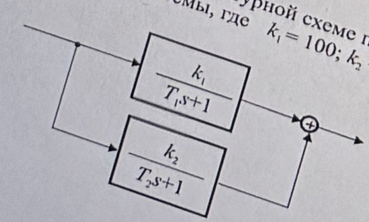
III) $W_3(s) = 0{,}5s^2 + 5{,}1s + 1$; $\xi = 1$

$W_3 = 2$

$A_3(\omega) : 0, -40$ дб/дек

$\varphi_3(\omega) : 0 \div 180°$

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