

Задание №2

Заданы передаточные функции звеньев представленных на рисунке варианта:

$$W_1(p) = \frac{10}{0,5p^2 + p + 10}, \quad W_2(p) = \frac{150}{0,1p^2 + 2p + 50}, \quad W_3(p) = \frac{p+1}{0,1p^2 + p + 10}$$

Выполнить необходимые преобразования структурной схемы САУ, сведя структурную схему к одному эквивалентному звену.

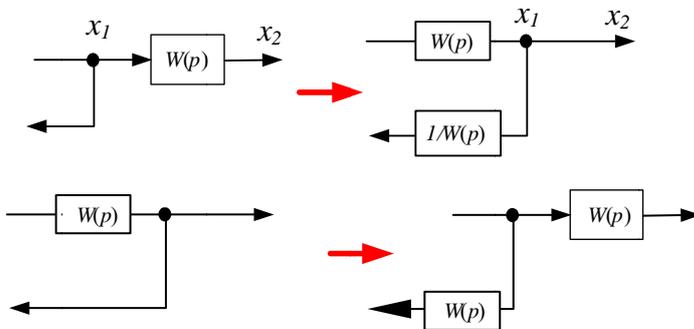
1. Прodelать все необходимые преобразования, сопровождая их рисунками.
2. Последовательно выполнять каждый шаг преобразования структурной схемы САУ в **MATLAB (Simulink)**, приводя для сравнения график переходного процесса.

ВАРИАНТ	
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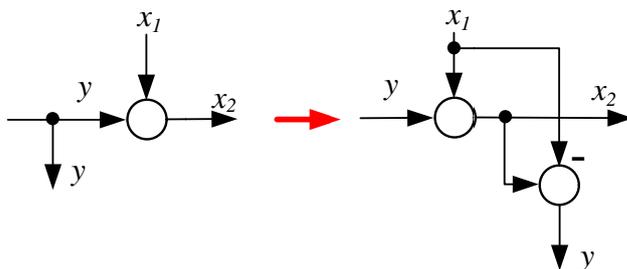
Возможные преобразования

Перенос узла через звено (или звена через узел)

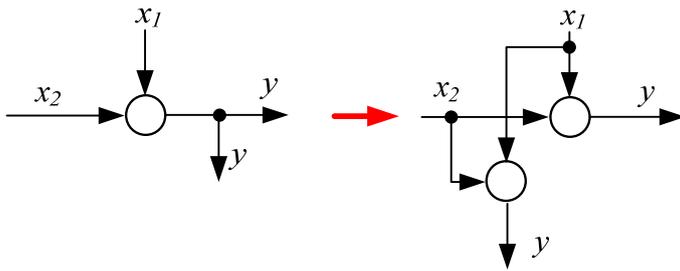


Перенос узла через сумматор

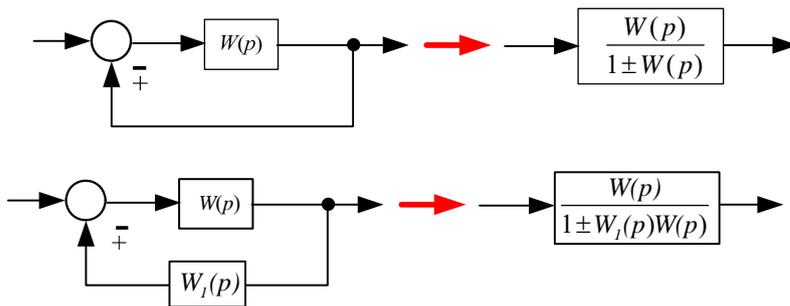
1. вперед



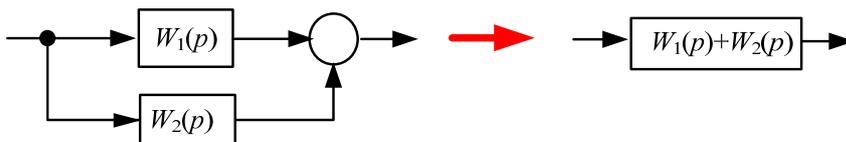
2. назад



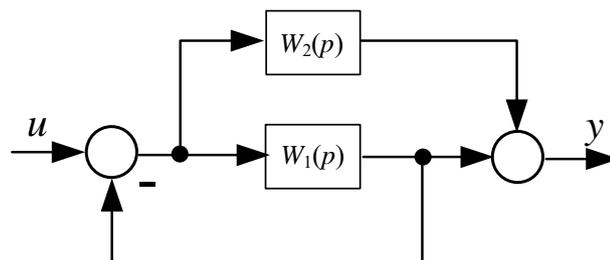
Включение обратной связи



Параллельное включение



Пример выполнения.



Преобразовать структурную схему до одного эквивалентного звена

Этап 2. Прописываем передаточные функции в командном окне MATLAB

```
>> w1=tf([1],[1 10])
```

Transfer function:

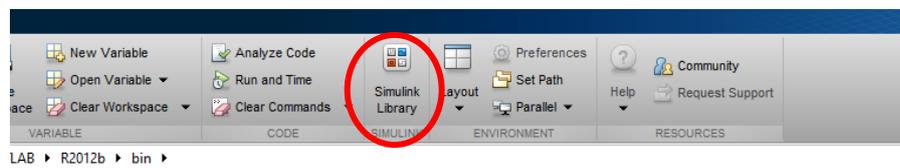
```
1
-----
s + 10
```

```
>> w2=tf([1 1],[1 10 100])
```

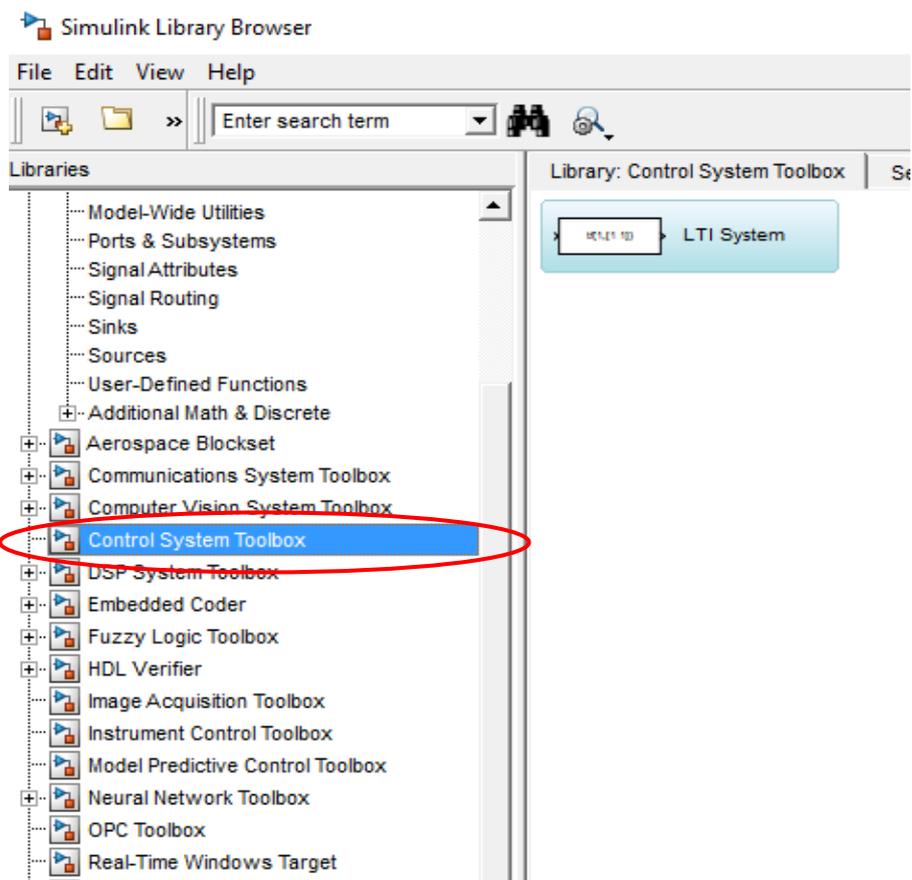
Transfer function:

```
      s + 1
-----
s^2 + 10 s + 100
```

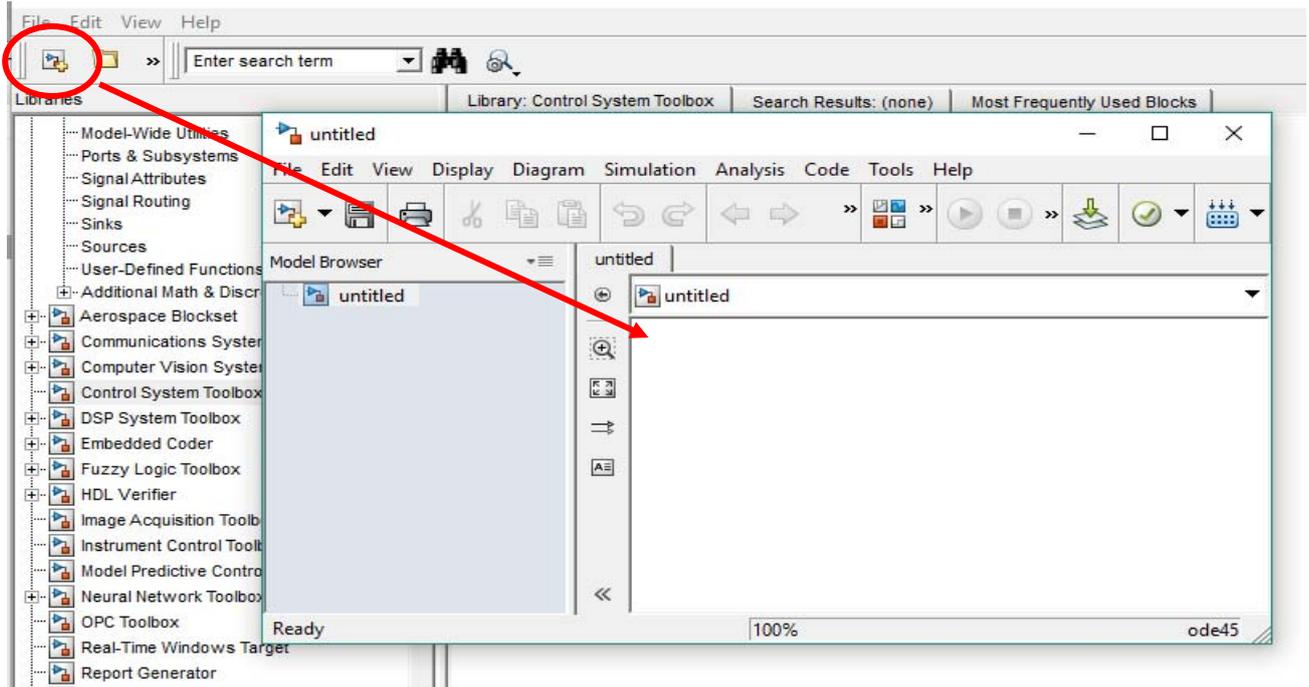
Этап-2: Вызываем Simulink Library



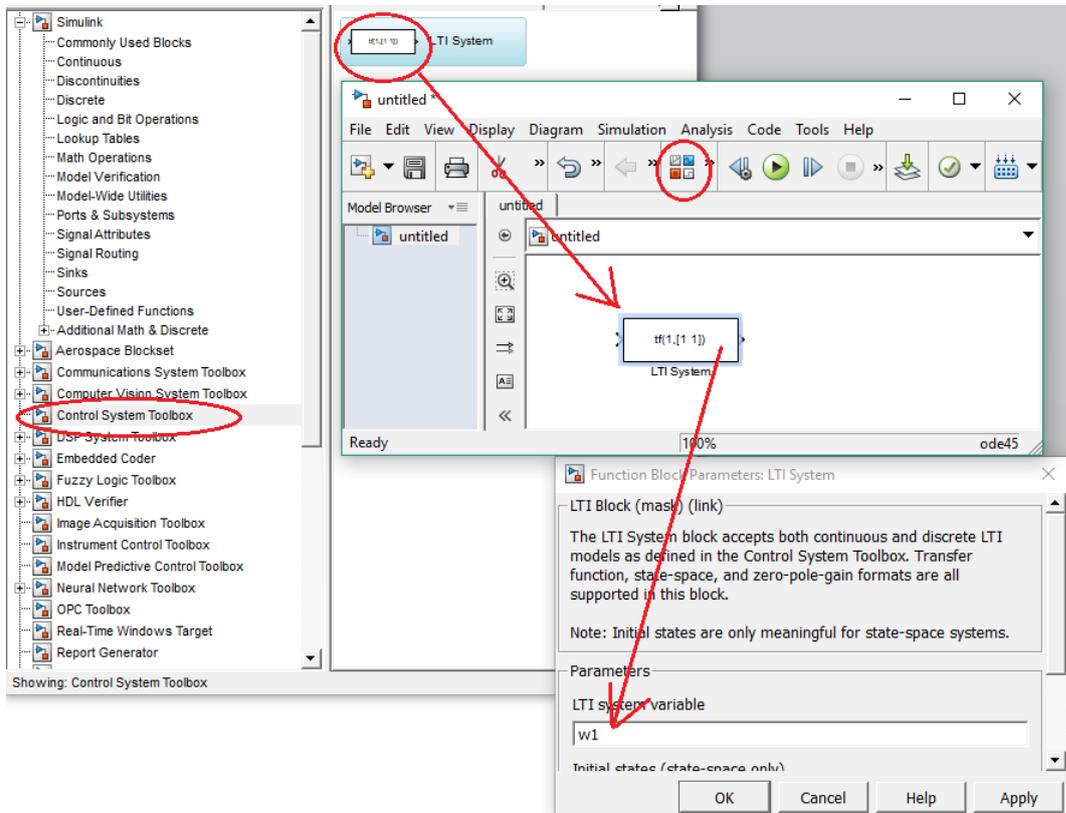
Этап-3: Открываем Control System Toolbox



Этап-4 : Открываем рабочую область



Этап-5: В рабочей области строим структурную модель, выбирая элементы из **Library Browser**



Этап – 6: Необходимые элементы схемы

The screenshot shows the Simulink library browser interface. The 'Libraries' pane on the left has 'Commonly Used Blocks' selected and highlighted with a red box. The main area displays a grid of blocks from the 'Library: Simulink/Commonly Used Blocks'. The 'Most Frequently Used Blocks' column highlights the 'Sum' block with a blue background.

Library: Simulink/Commonly Used Blocks	Search Results: (none)	Most Frequently Used Blocks		
Bus Creator	Bus Selector	Constant	Convert	Data Type Conversion
Delay	Demux	Discrete-Time Integrator	Gain	Gain
Ground	In1	Integrator	Logical Operator	Logical Operator
Mux	Out1	Product	Relational Operator	Relational Operator
Saturation	Scope	Subsystem	Sum	Sum
Switch	Terminator	Vector Concatenate		

The screenshot shows the Simulink library browser interface. The 'Libraries' pane on the left has 'Sinks' selected and highlighted with a red box. The main area displays a grid of blocks from the 'Library: Simulink/Sinks'. The 'Scope' block is highlighted with a blue background.

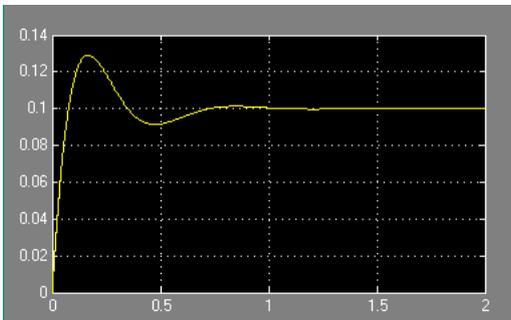
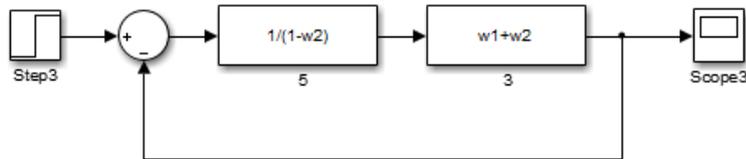
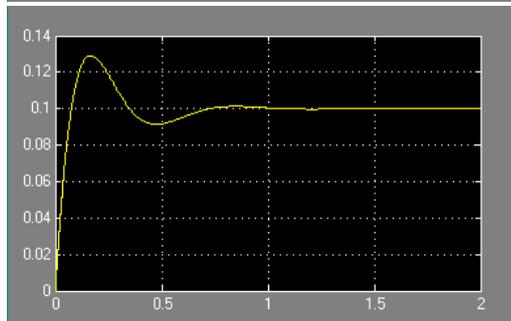
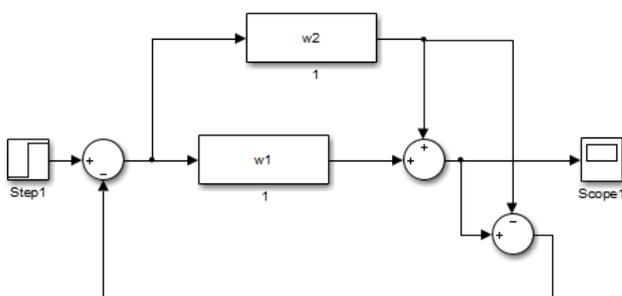
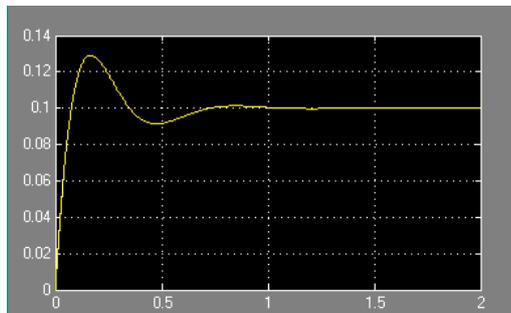
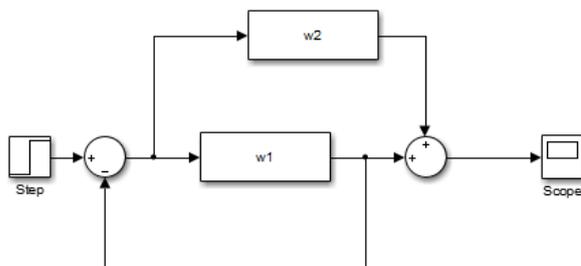
Library: Simulink/Sinks	Search Results: (none)	Most Frequently Used Blocks
Display	Floating Scope	Out1
Scope	Stop Simulation	Terminator
To File	To Workspace	XY Graph

Libraries

- Simulink
 - Commonly Used Blocks
 - Continuous
 - Discontinuities
 - Discrete
 - Logic and Bit Operations
 - Lookup Tables
 - Math Operations
 - Model Verification
 - Model-Wide Utilities
 - Ports & Subsystems
 - Signal Attributes
 - Signal Routing
 - Sinks
 - Sources**
 - User-Defined Functions
 - Additional Math & Discrete
- Aerospace Blockset
- Communications System Toolbox
- Computer Vision System Toolbox
- Control System Toolbox

Library: Simulink/Sources | Search Results: (none) | Most Frequently Used Blocks

	Band-Limited White Noise		Chirp Signal		Clock
	Constant		Counter Free-Running		Counter Limited
	Digital Clock		Enumerated Constant		From File
	From Workspace		Ground		In1
	Pulse Generator		Ramp		Random Number
	Repeating Sequence		Repeating Sequence Interpol...		Repeating Sequence Stair
	Signal Builder		Signal Generator		Sine Wave
	Step		Uniform Random Number		





$$\frac{(w1+w2)(1-w2)}{1+(w1+w2)(1-w2)}$$

3

