

sisotool(objekt_lti)

objekt_lti = model obiektu (bez regulatora)

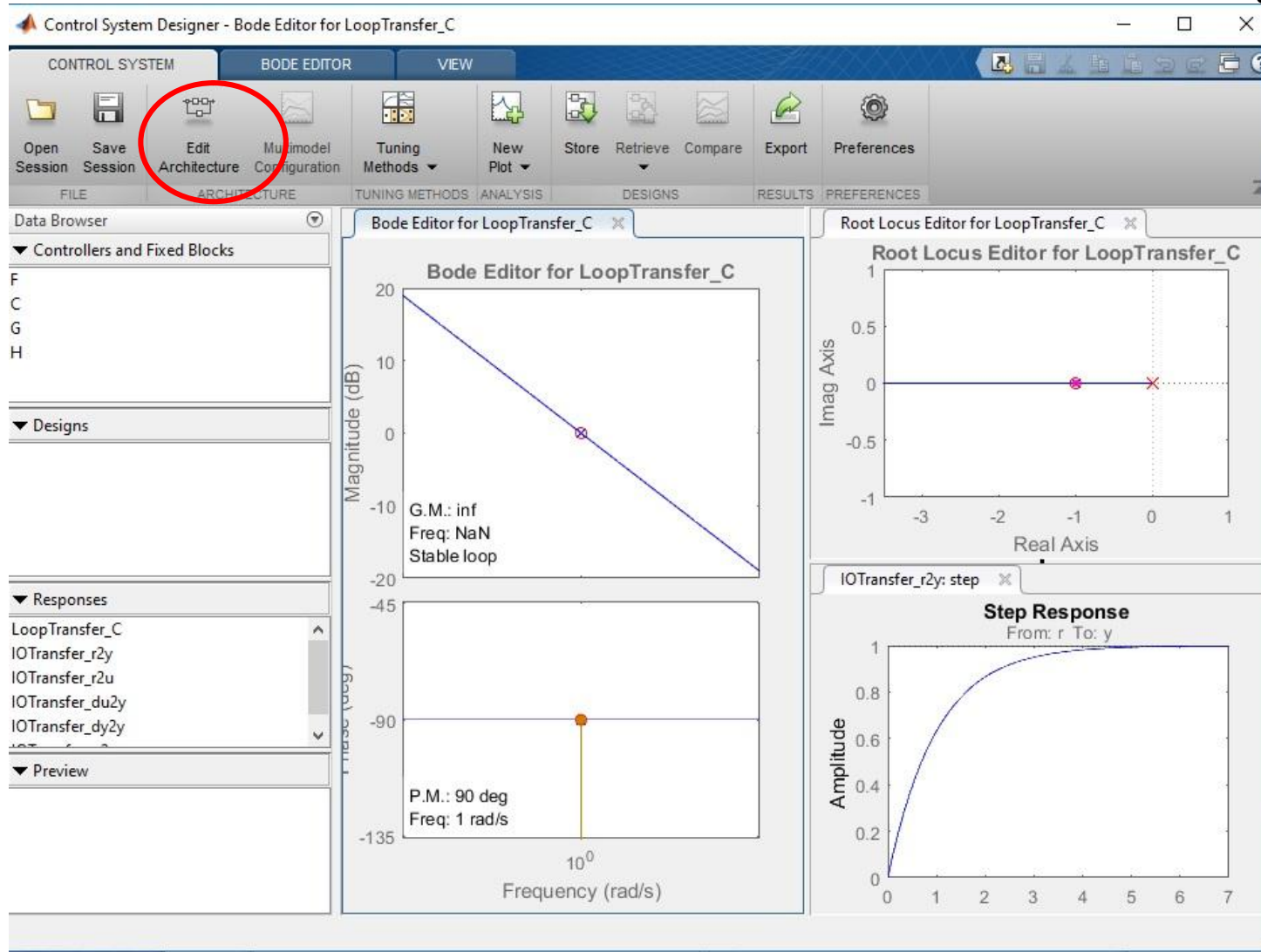
sisotool(objekt_lti, regulator)

SISO Design (obiekt LTI) od v.2015

4.1) SISO Design

- struktura

układu regulacji



SISO Design (obiekt LTI)

4.1) SISO Design
 - struktura układu
 - typ regulatora

The screenshot shows the 'Edit Architecture' dialog box in the Bode Editor. The 'Loop Signs' tab is active, displaying a table of block parameters:

Identifier	Block Name	Value
C	C	<1x1 zpk>
F	F	<1x1 zpk>
G	G	<1x1 tf>
H	H	<1x1 tf>

Annotations in the image include:

- A red circle around the 'Edit Architecture' button in the top toolbar.
- Red circles around the 'Value' cells for blocks C and G in the table.
- Handwritten text next to the circled 'C' value: $regPI = 1 + 1/(2*s)$.
- Handwritten text next to the circled 'G' value: *obiekt*.

The background shows a block diagram of a control system with blocks F, C, G, and H, and a Bode plot with a phase margin of 90 degrees at a frequency of 1 rad/s.

4.3) SISO Design
- projektowanie
graficzne

CONTROL SYSTEM **BODE EDITOR** **VIEW**

Open Session Save Session Edit Architecture Multimodel Configuration Tuning Methods New Plot Store Retrieve Compare Export Preferences

FILE ARCHITECTURE

Data Browser

▼ Controllers and Fixed Blocks

F
C
G
H

▼ Designs

▼ Responses

LoopTransfer_C
IOTransfer_r2y
IOTransfer_r2u
IOTransfer_du2y
IOTransfer_dy2y

▼ Preview

GRAPHICAL TUNING

1) Bode ukł. otwartego
Bode Editor
Edit feedback loop using Bode plot

2) Bode ukł. zamkniętego
Closed-Loop Bode Editor
Edit closed loop using Bode plot

3) linie pierwiastkowe
Root Locus Editor
Edit compensators using root locus plot

4) Nichols ukł. otwartego
Nichols Editor
Edit feedback loop using Nichols plot

AUTOMATED TUNING

PID PID Tuning
Tune PID compensator using robust response time or classical methods

$\int z^T Q z dt$ LQG Synthesis
Obtain feedback compensator using Linear-Quadratic-Gaussian design

IMC Internal Model Control (IMC) Tuning
Obtain feedback compensator using IMC design

Magnitude (dB)

Frequency (rad/s)

Root Locus Editor for LoopTransfer_C

Root Locus Editor for LoopTransfer_C

Imag Axis

Real Axis

IOTransfer_r2y: step

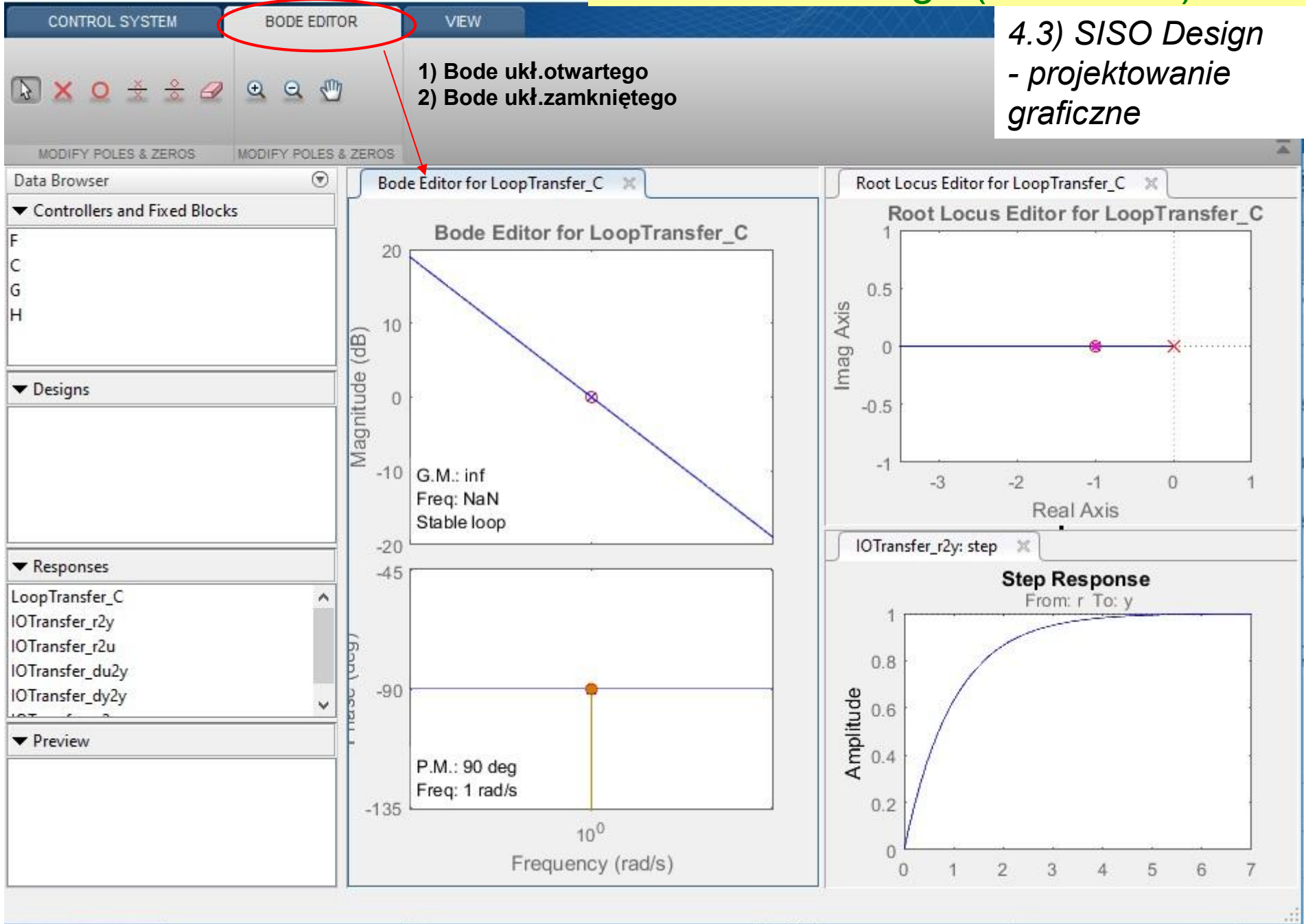
Step Response

From: r To: + -

Amplitude

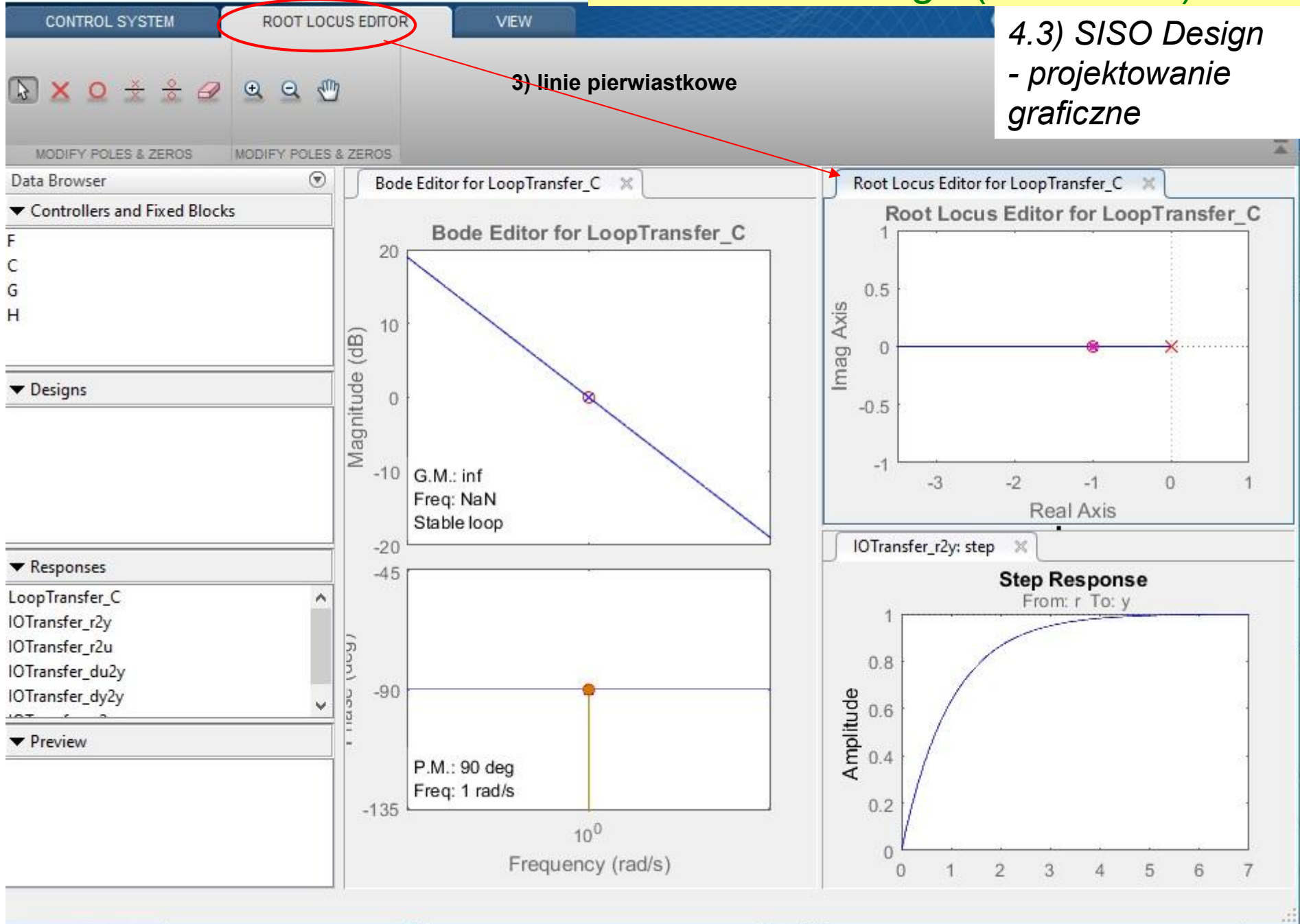
SISO Design (obiekt LTI)

4.3) SISO Design - projektowanie graficzne



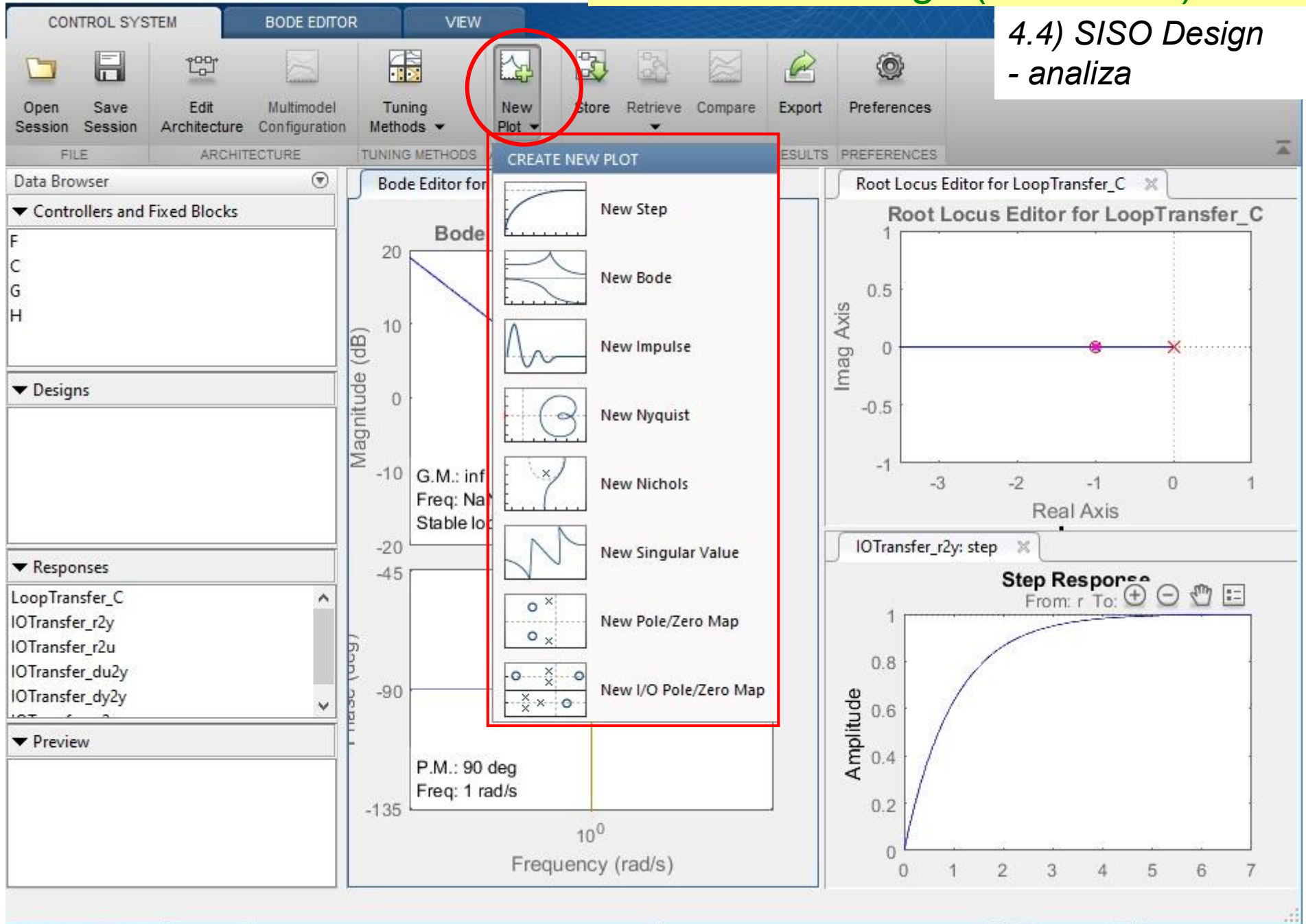
SISO Design (obiekt LTI)

4.3) SISO Design
- projektowanie
graficzne



SISO Design (obiekt LTI)

4.4) SISO Design - analiza



5) SISO Design (strojenie)

The screenshot displays the 'BODE EDITOR' window for 'LoopTransfer_C'. The 'Tuning Methods' menu is open, showing options for manual and automated tuning. The 'AUTOMATED TUNING' section is highlighted with a red box and contains the following items:

- PID** **1) PID**
PID Tuning
Tune PID compensators using robust response time or classical methods
- LQG** **3) LOQ**
LQG Synthesis
Obtain feedback compensator using Linear-Quadratic-Gaussian design
- IMC** **4) IMC**
Internal Model Control (IMC) Tuning
Obtain feedback compensator using IMC design

The interface also shows a 'Root Locus Editor for LoopTransfer_C' window with a plot of the root locus on the complex plane, and a 'Step Response' window showing the system's response to a step input. The step response plot shows the amplitude increasing from 0 to 1 over time, with a settling time of approximately 4 seconds.

5.1) SISO Design (strojenie)
PID Tuning

The screenshot displays the Control System Designer software interface. The main window is the Root Locus Editor for LoopTransfer_C. A red box highlights the PID Tuning dialog box, which is currently open. The dialog box shows the Compensator transfer function $C = 1 \times \frac{(1+s)}{s}$. The Tuning method is set to Robust response time, which is circled in red. The Controller Type is set to PI. The Design mode is set to Time. The Response Time (seconds) is set to 1.123, and the Aggressive/Transient Behavior/Robust slider is set to 0.6. The dialog box also includes buttons for Update Compensator and Help.

The Root Locus Editor shows the root locus plot with poles at $s = -1$ and $s = 0$, and a zero at $s = -1$. The plot is titled "LoopTransfer_C Editor for LoopTransfer_C".

The Bode plot shows the magnitude and phase response. The magnitude plot is titled "Magnitude (dB)" and the phase plot is titled "Phase (deg)". The phase plot shows a phase margin (P.M.) of 90 degrees at a frequency of 1 rad/s.

The Step Response plot shows the system's response to a step input. The plot is titled "Step Response" and shows the response from r to To .

5.3) SISO Design (strojenie)
IMC Tuning

The screenshot displays the Control System Designer interface with the Root Locus Editor for LoopTransfer_C. The main window is titled "Internal Model Control (IMC) Tuning".

Compensator: $C = 1 \times \frac{(1 + s)}{s}$

Select Loop to Tune: LoopTransfer_C

Specifications:
Dominant closed-loop time constant: 0.195603722266989
Desired controller order: 2

Buttons: Update Compensator, Help

Background Plots:
- **Root Locus:** Shows poles (marked with 'x') and zeros (marked with 'o') on the real axis. The real axis ranges from -1 to 1.
- **Bode Plot:** Shows Magnitude (dB) vs Frequency (rad/s). The magnitude is -90 dB at 1 rad/s. The phase margin (P.M.) is 90 deg at 1 rad/s.
- **Response:** Shows Amplitude vs Time. The amplitude starts at 0 and rises to approximately 0.8 over 7 seconds.

SISO Design (obiekt LTI)

5.4) SISO Design (strojenie) LQG Synthesis

Control System Designer - Root Locus Editor for LoopTransfer_C

CONTROL SYSTEM ROOT LOCUS EDITOR VIEW

Open Session Save Session Edit Architecture Multimodel Configuration Tuning Methods New Plot Store Retrieve Compare Export Preferences

FILE ARCHITECTURE

Data Browser

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G
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LoopTransfer_C
IOTransfer_r2y
IOTransfer_r2u
IOTransfer_du2y
IOTransfer_dy2y

▼ Preview

LQG Synthesis

Compensator

$C = 1 \times \frac{(1+s)}{s}$

Select Loop to Tune

LoopTransfer_C

Add new loop ...

Specifications

Controller response: Aggressive Robust

Measurement noise: Small Large

Desired controller order: 1 2

Update Compensator Help

Magnitude (dB)

Real Axis

Step Response

From: r To: + - Hand Menu

P.M.: 90 deg
Freq: 1 rad/s

Frequency (rad/s)

Amp