

PRIMJER 1 S.S. – SAP2000

MJERNE JEDINICE - [kNm]

FILE – NEW MODEL – BLANK

DEFINE – SECTION PROPERTIES – LINK/SUPPORT PROPERTIES

ADD NEW PROPERTIES

Definirati element veze (link) sa karakteristikama linearnog dampera

Aktivirati stupanj slobode U1 (ostalo su slobodni)

MODIFY/SHOW FOR U1

Upisati linearnu krutost ($k = 1,0 \text{ kN/m}$) i prigušenje ($c = 0$)

The image displays three overlapping screenshots of the SAP2000 software interface, illustrating the process of defining a link property.

- Top Left Screenshot: Link/Support Properties**
 - Buttons: Add New Property..., Modify/Show Property..., Delete Property, OK, Cancel.
- Bottom Left Screenshot: Link/Support Directional Properties**
 - Identification section: Property Name (LIN1), Direction (U1), Type (Damper), NonLinear (No).
 - Properties Used For All Analysis Cases section: Effective Stiffness (1), Effective Damping (0).
 - Buttons: OK, Cancel.
- Right Screenshot: Link/Support Property Data**
 - Link/Support Type: Damper.
 - Property Name: LIN1.
 - Buttons: Set Default Name, Modify/Show...
 - Total Mass and Weight section: Mass (0), Weight (0), Rotational Inertia 1 (0), Rotational Inertia 2 (0), Rotational Inertia 3 (0).
 - Factors For Line, Area and Solid Springs section: Property is Defined for This Length In a Line Spring (1), Property is Defined for This Area In Area and Solid Springs (1).
 - Directional Properties section: Table with columns Direction, Fixed, NonLinear, and Properties.
 - P-Delta Parameters section: Advanced... button.
 - Buttons: OK, Cancel.

VIEW – SET 2D VIEW – X-Z PLANE (Y=0)

VIEW – SHOW AXES

- Isključiti jedan prozor
- Prikaz u x-z ravni (model samo u jednoj dimenziji!)
- Isključiti koordinatne osi
- Uključiti vidljivost točaka
- Uključiti oznake točaka i linkova
- Uključiti lokalne osi točaka i linka

DRAW – DRAW TWO JOINT LINK

- Nacrtati bilo gdje link i promijeniti koordinate točaka na 0,0 i 0,1 (desni klik mišem)
- Duljina linka je 1,0 m u smjeru osi z

OPTIONS – DIMENSIONS – MINIMUM GRAPHICS FONT SIZE - 8

Pridružiti masu točki (materijalna točka)

Označiti gornju točku linka

ASSIGN – JOINT – MASSES

Pridružiti masu kao težinu (mjerna jedinica kN), $w = 1,0$ kN ($m = 100$ kg)

Masa pridružena u smjeru lokalne osi 3 (globalna os z) – prikazati lokalne osi linka

Joint Masses

Specify Joint Mass

☐ As Mass

☒ As Weight

☐ As Volume and Material Property

Material

Mass Direction

Coordinate System

Weight

Local 1 Axis Direction

Local 2 Axis Direction

Local 3 Axis Direction

Weight Moment of Inertia

Rotation About Local 1 Axis

Rotation About Local 2 Axis

Rotation About Local 3 Axis

Options

☐ Add to Existing Masses

☒ Replace Existing Masses

☐ Delete Existing Masses

Units

Definirati rubne uvjete

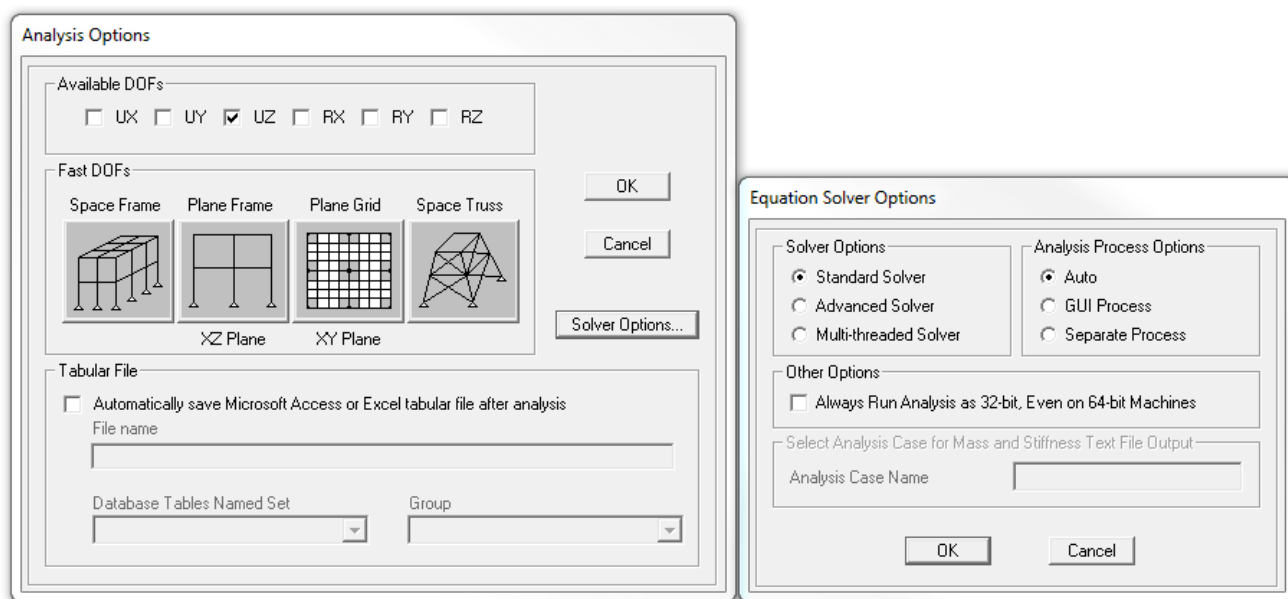
Označiti donju točku linka

ASSIGN – JOINT – RESTRAINTS – upeti spoj

Aktivirati samo stupanj slobode u smjeru z (problem s 1 stupnjem slobode - translacija)

ANALYZE – SET ANALYSIS OPTIONS – uz

ANALYZE – SET ANALYSIS OPTIONS – SOLVER OPTIONS – standard solver



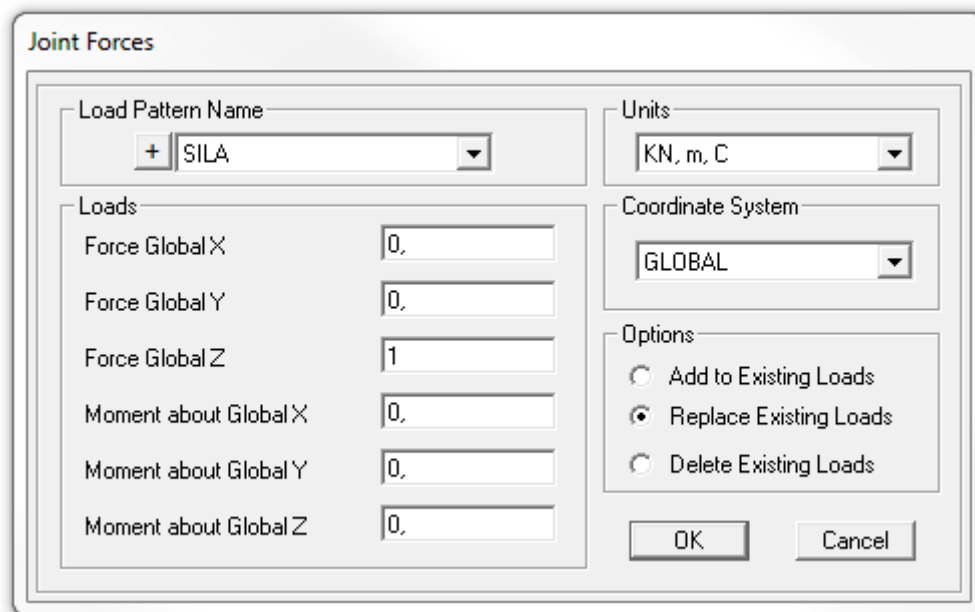
Definirati jedinično opterećenje

DEFINE – LOAD PATTERNS – sila (LIVE)

Izbrisati DEAD load

Označiti slobodnu točku linka (točka u kojoj je masa)

ASSIGN – LOAD LOADS – FORCES – smjer z (1,0 kN)



Definirati vremenski promjenljivo opterećenje

DEFINE – FUNCTIONS – TIME HISTORY – Add new function (USER)

Time History Function Definition

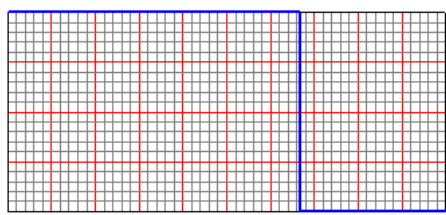
Function Name:

Define Function

Time	Value
0.	1.
0.	1.
20.	1.
20.01	0.
30.	0.

Add Modify Delete

Function Graph



Display Graph 0.0,0.0

OK Cancel

Definirati dinamički slučaj opterećenja

DEFINE – LOAD CASES – Add new Load Case

Load Case Data - Linear Direct Integration History

Load Case Name: Set Def Name Notes:

Load Case Type: Design...

Stiffness to Use:

☒ Zero Initial Conditions - Unstressed State

☐ Stiffness at End of Nonlinear Case

Important Note: Loads from the Nonlinear Case are NOT included in the current case

Modal Load Case:

Use Modes from Case

Loads Applied

Load Type	Load Name	Function	Scale Factor
Load Pattern	SILA	konstanta	1
Load Pattern	SILA	konstanta	1

Add Modify Delete

☐ Show Advanced Load Parameters

Time Step Data

Number of Output Time Steps:

Output Time Step Size:

Other Parameters

Damping:

Time Integration:

OK Cancel

Prikazati rezultate analize:

PRIKAZATI OBLIK OSCILIRANJA I PRVI PERIOD (1 S.S.)

Prikazati pomak slobodne točke u vremenu (odgovor stupnja slobode)
Označiti točku

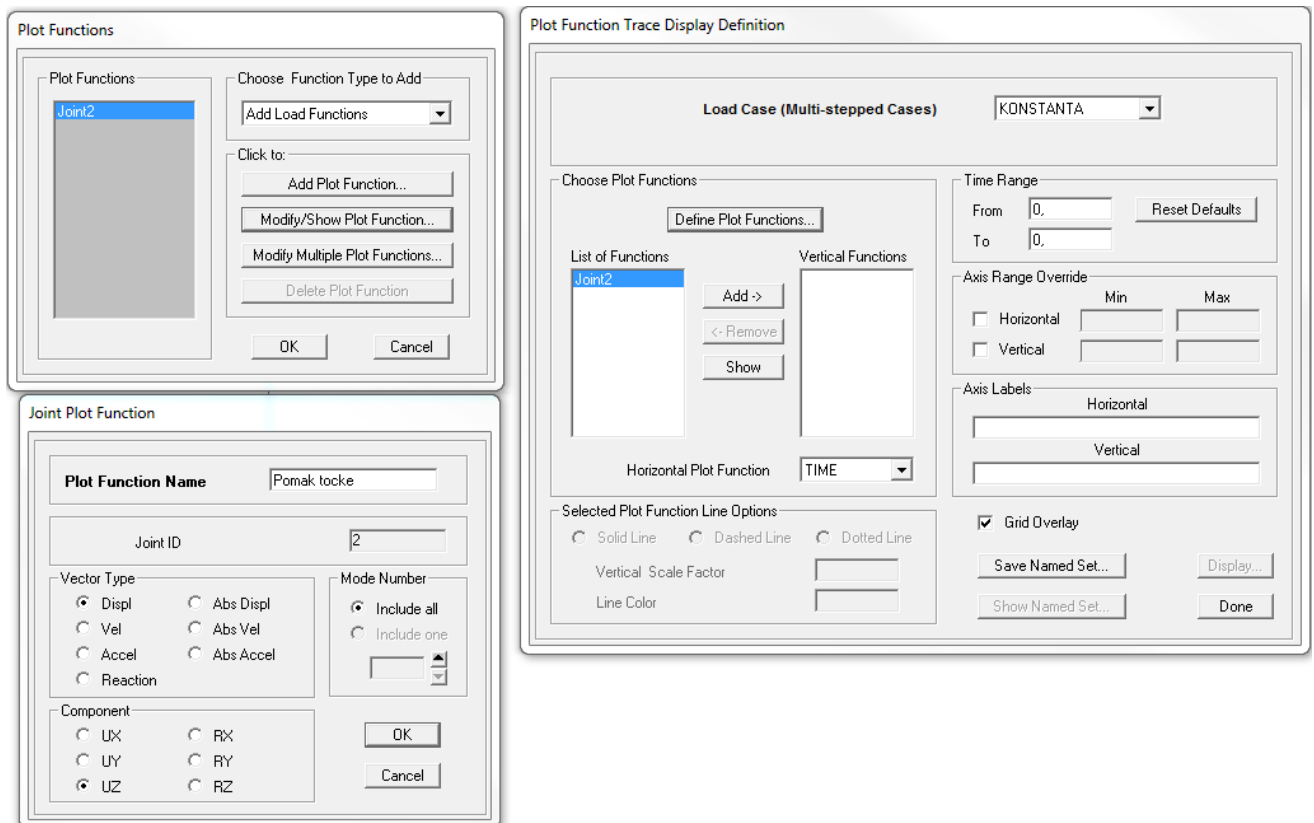
DISPLAY – SHOW PLOT FUNCTIONS

Define plot functions – označiti „Joint 2“ – Modify

Nazvati funkciju „Pomak tocke“ i definirati pomak u smjeru osi z

Definirati funkciju brzine i ubrzanja iste točke „Joint 2“ (provjeriti broj čvora)

Definirati funkciju sile u linku (uzdužna sila)



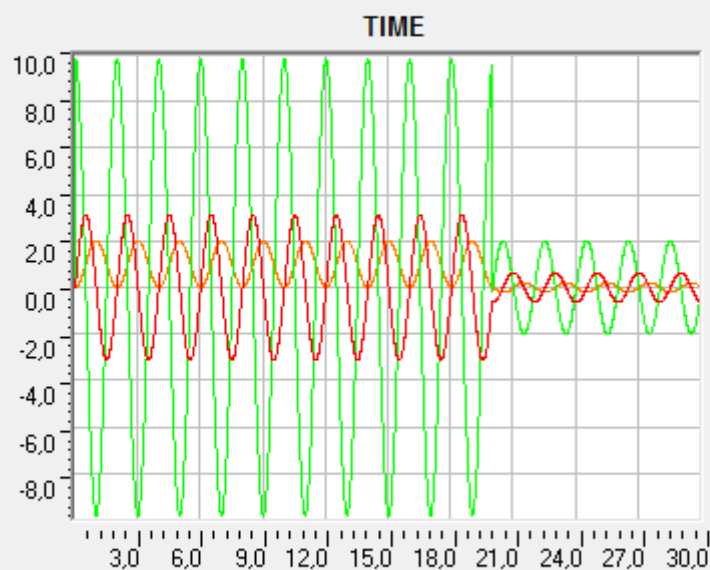
PRIKAZATI ANIMACIJU SA DIJAGRAMOM

pomak – vrijeme
brzina – pomak

sila – vrijeme
sila - pomak

Display Plot Function Traces (KONSTANTA)

File



Legend

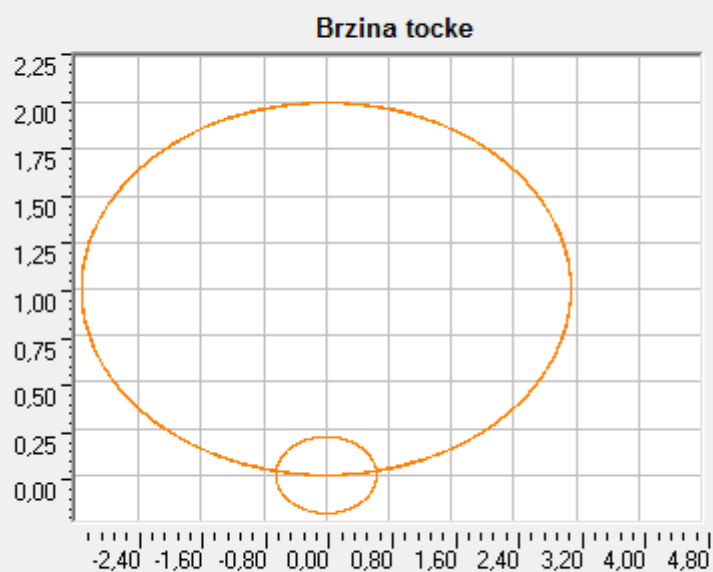
— Pomak tocke
— Ubrzanje tocke
— Brzina tocke
Min is -9,805e+00
at 1,706e+01
Max is 9,805e+00
at 1,405e+01

(28,75 , -4,40)

OK

Display Plot Function Traces (KONSTANTA)

File



Legend

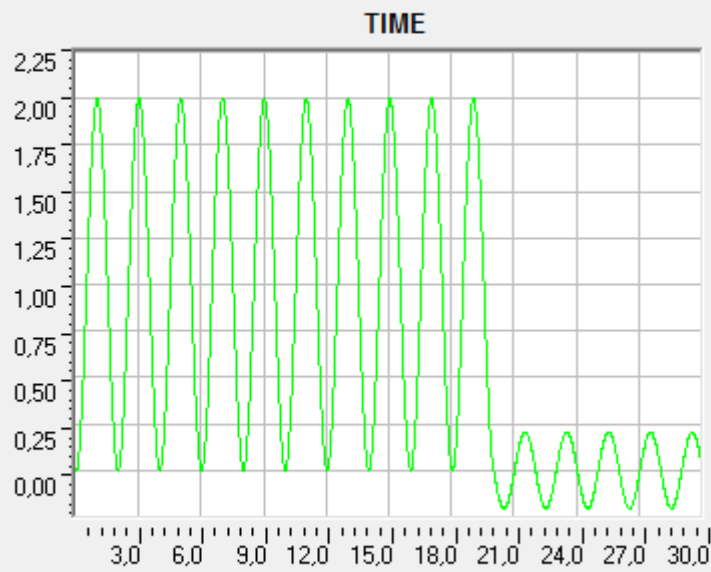
Vertical Axis
Joint 2
Displacement UZ
Min is -2,054e-01
at 9,882e-04
Max is 2,000e+00
at 8,554e-03
Horizontal Axis
Brzina tocke

(4,34 , 2,24)

OK

Display Plot Function Traces (KONSTANTA)

File



Legend

Link 1 at End-I
Axial Force

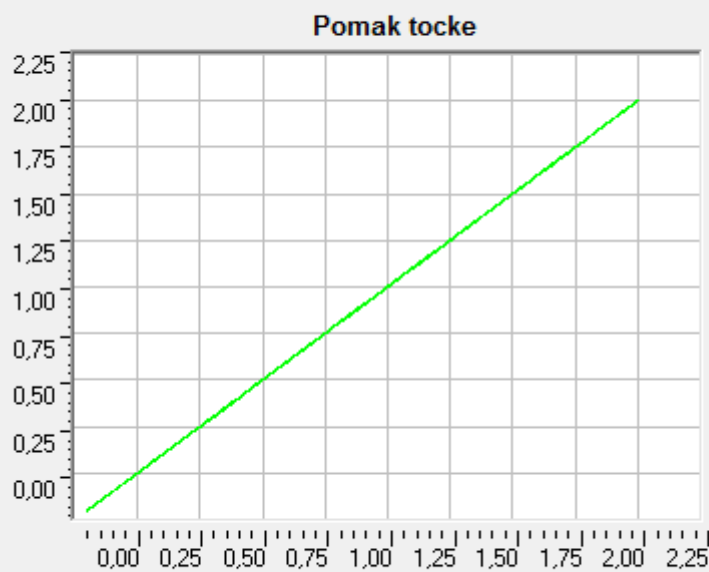
Min is -2,054e-01
at 2,054e+01
Max is 2,000e+00
at 1,706e+01

(29,90 , -2,371E-02)

OK

Display Plot Function Traces (KONSTANTA)

File



Legend

Vertical Axis
Link 1 at End-I
Axial Force

Min is -2,054e-01
at -2,054e-01
Max is 2,000e+00
at 2,000e+00

Horizontal Axis
Pomak tocke

(2,23 , 2,02)

OK

Dodati prigušenje linearno linku

Link/Support Directional Properties

Identification

Property Name	damper
Direction	U1
Type	Damper
NonLinear	No

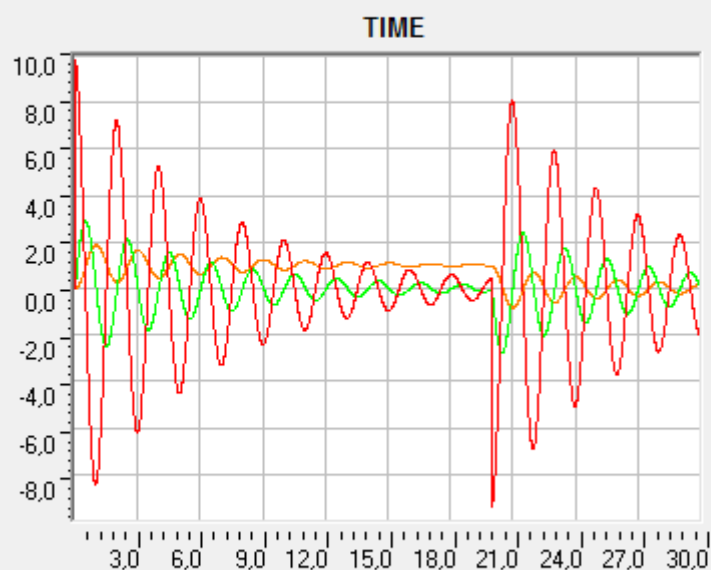
Properties Used For All Analysis Cases

Effective Stiffness	1.
Effective Damping	0,0316

OK Cancel

Display Plot Function Traces (KONSTANTA)

File



Legend

— Pomak tocke
— Brzina tocke
— Ubrzanje tocke

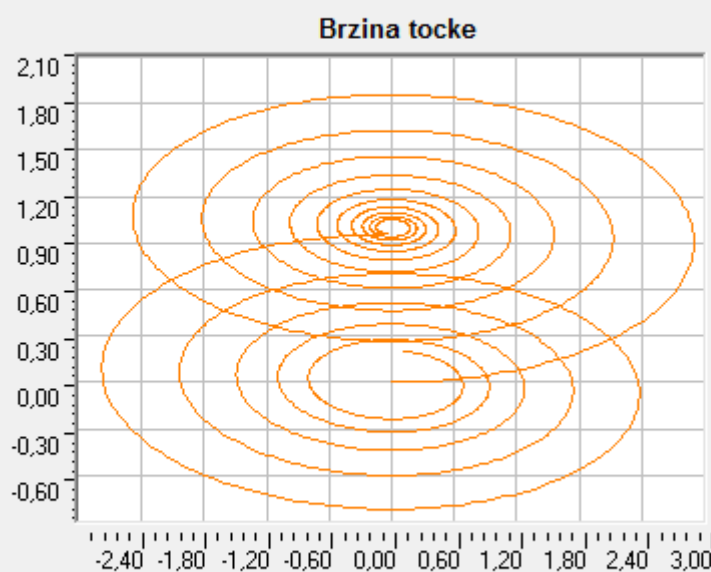
Min is $-9,357e+00$
at $2,001e+01$
Max is $9,789e+00$
at $1,000e+02$

(24,71 , 8,79)

OK

Display Plot Function Traces (KONSTANTA)

File



Legend

Vertical Axis
Joint 2
Displacement UZ

Min is $-8,192e-01$
at $3,761e-02$
Max is $1,856e+00$
at $-4,027e-03$

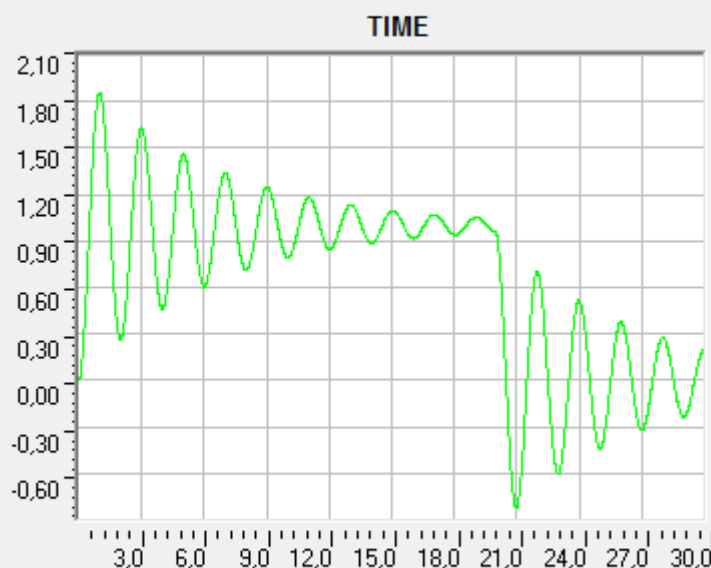
Horizontal Axis
Brzina tocke

(-1,63 , 2,07)

OK

Display Plot Function Traces (KONSTANTA)

File



Legend

Link 1 at End-I
Axial Force

Min is -8,233e-01
at 2,097e+01
Max is 1,860e+00
at 9,800e-01

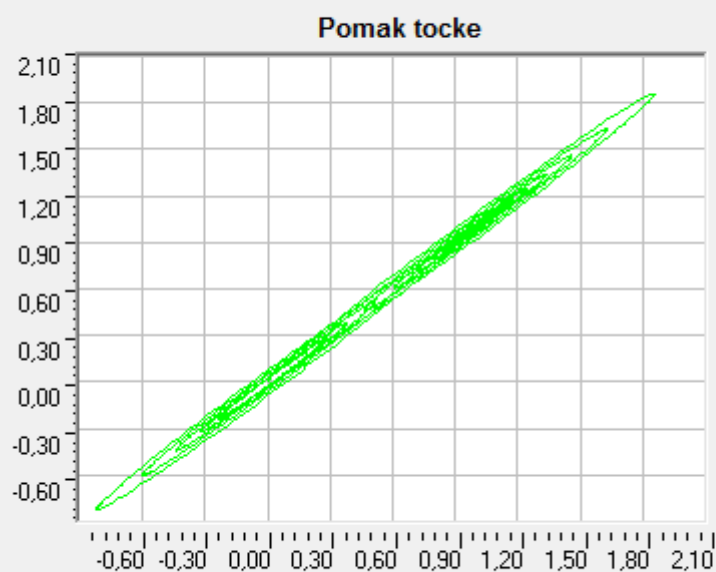
(21,15 , 2,10)

OK

Link Sila

Display Plot Function Traces (KONSTANTA)

File



Legend

Vertical Axis
Link 1 at End-I
Axial Force

Min is -8,233e-01
at -8,143e-01
Max is 1,860e+00
at 1,852e+00

Horizontal Axis
Pomak tocke

(2,09 , -5,948E-02)

OK

Link Sila