

STATIC ANALYSIS OF A PLANAR TRUSS

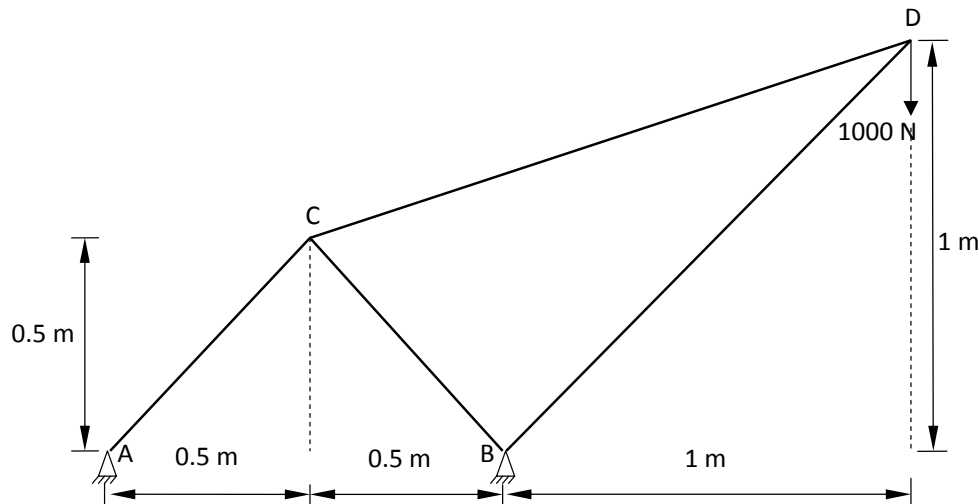


Figure 1

Consider a planar truss loaded as shown in the Figure 1. Find the maximum displacement and deformed shape of the truss.

Material property: $E = 2.1E+11 \text{ Pa}$, $\nu = 0.3$

Point load, $P = -1000 \text{ N}$

Cross sectional area of AC and BC $= 0.0002 \text{ m}^2$

Cross sectional area of CD and BD $= 0.0001 \text{ m}^2$

PROCEDURE

STEP

1. Create the points A, B, C and D at (0,0,0), (1,0,0), (0.5,0.5,0), (2,1,0) respectively.

Commands : POINT, ADD
 Menu : Geometry → Key point → Create → By X/Y/Z
 Parameters : (To be filled by the user)

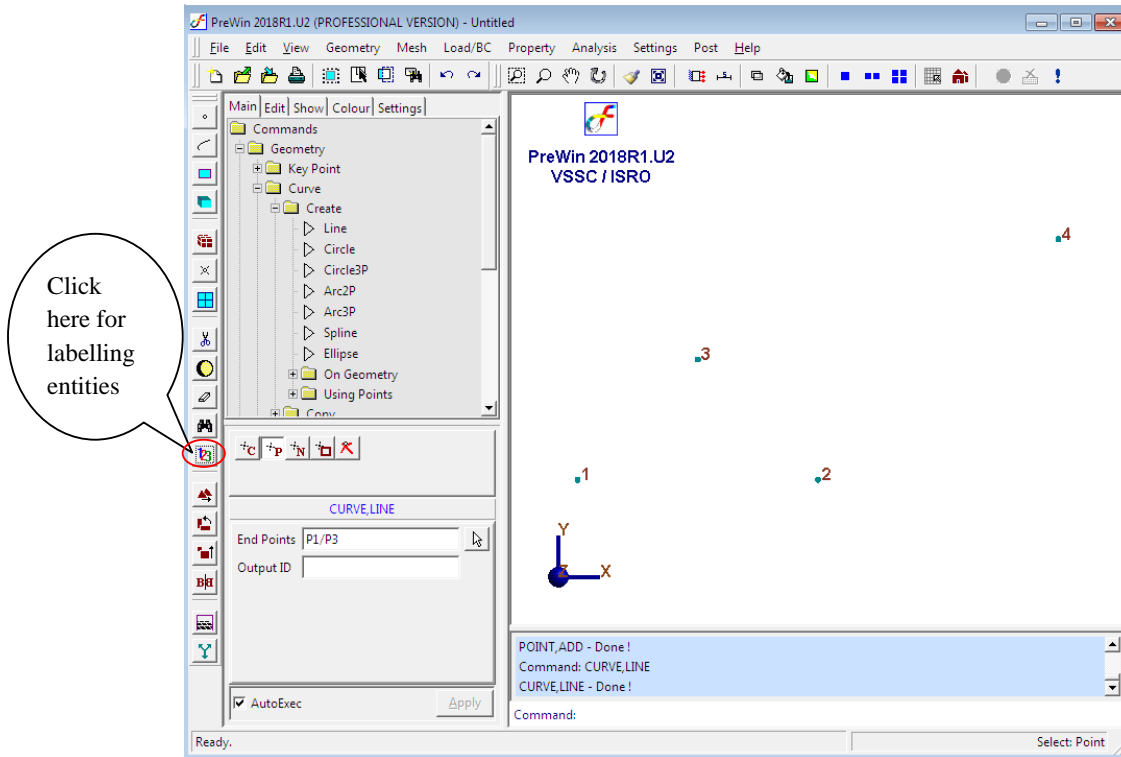
Coordinate Data	0/0/0
Coordinate Type	0
Entity ID	

Similarly create the other points.

Note:

Click "**Apply**" button or press **ctrl+enter** key after completing each step. "Done" message appears on message box for every step executed successfully.

At the end of the above operations, your screen should look like this



2. Create lines AC, BC, CD and BD.

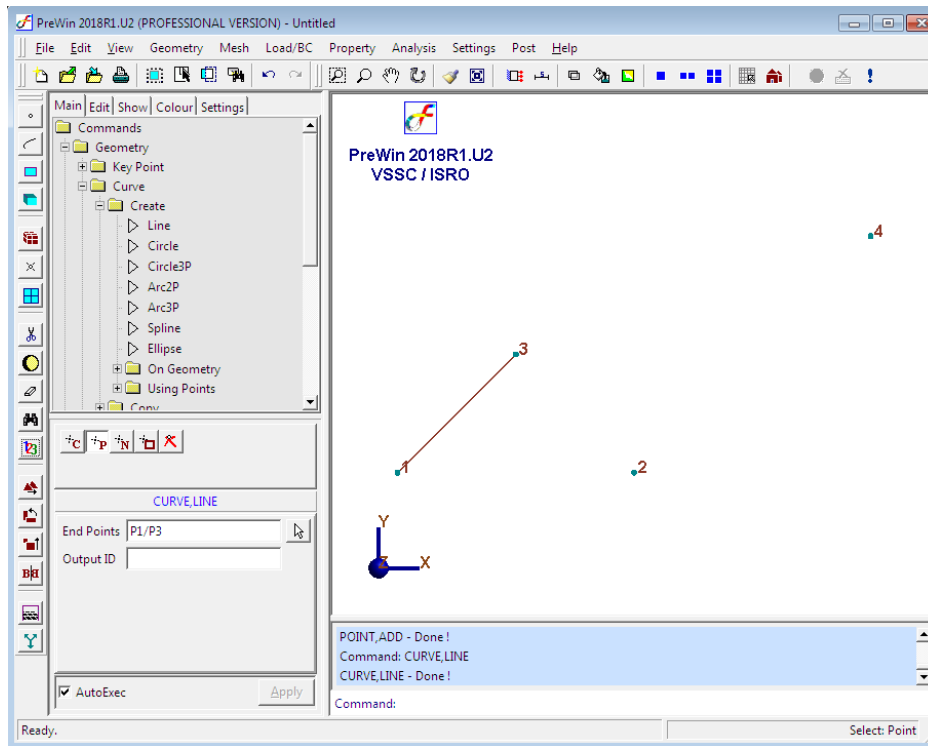
Commands : CURVE, LINE

Menu : Geometry → Curve → Create → Line

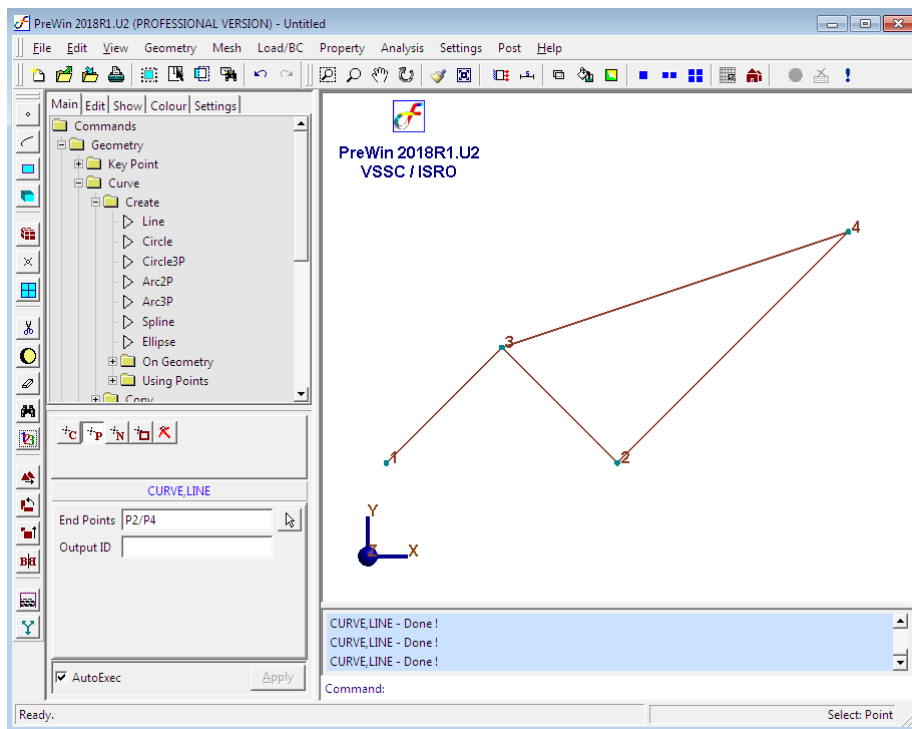
Parameters :

End points	Use Mouse to pick the points 1 & 3
Entity ID	1

This will create the line AC.



Similarly create the lines BC, CD and BD. At the end of the above operations, your screen should look like this.



3. Meshing using beam elements

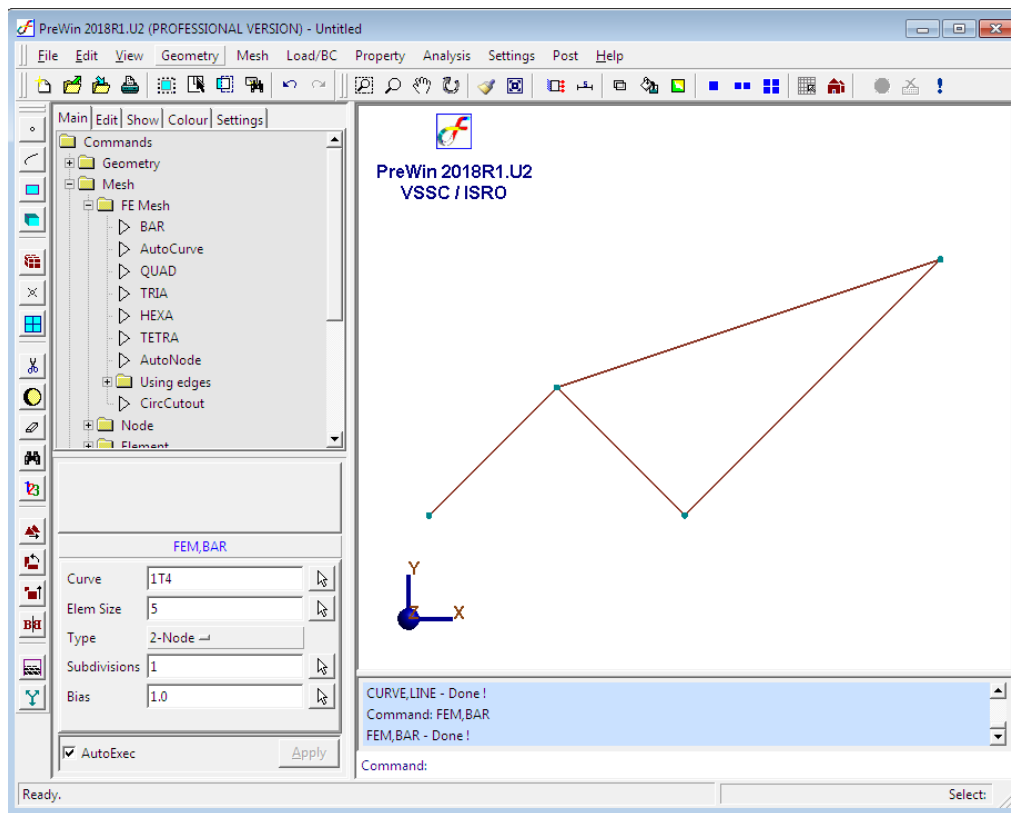
For creating rod elements first meshing is done using beam elements and then modified as rod elements.

Commands : FEM, BAR
 Menu : Mesh → FE Mesh → Bar
 Parameters :

Curve	1T4
Element Size	5
Type	2-node
Subdivisions	1
Bias	1.0

Note:

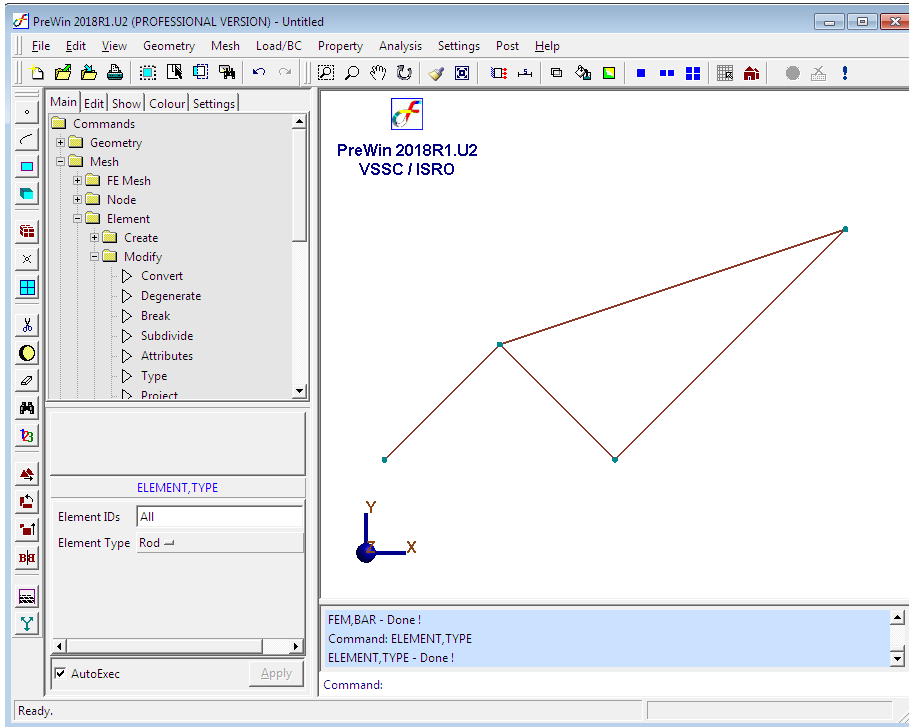
Right click/left click mouse point to alter sub-divisions.



4. Convert beam elements into rod elements

- Commands : ELEMENT, TYPE
 Menu : Mesh → Element → Modify → Type
 Parameters :

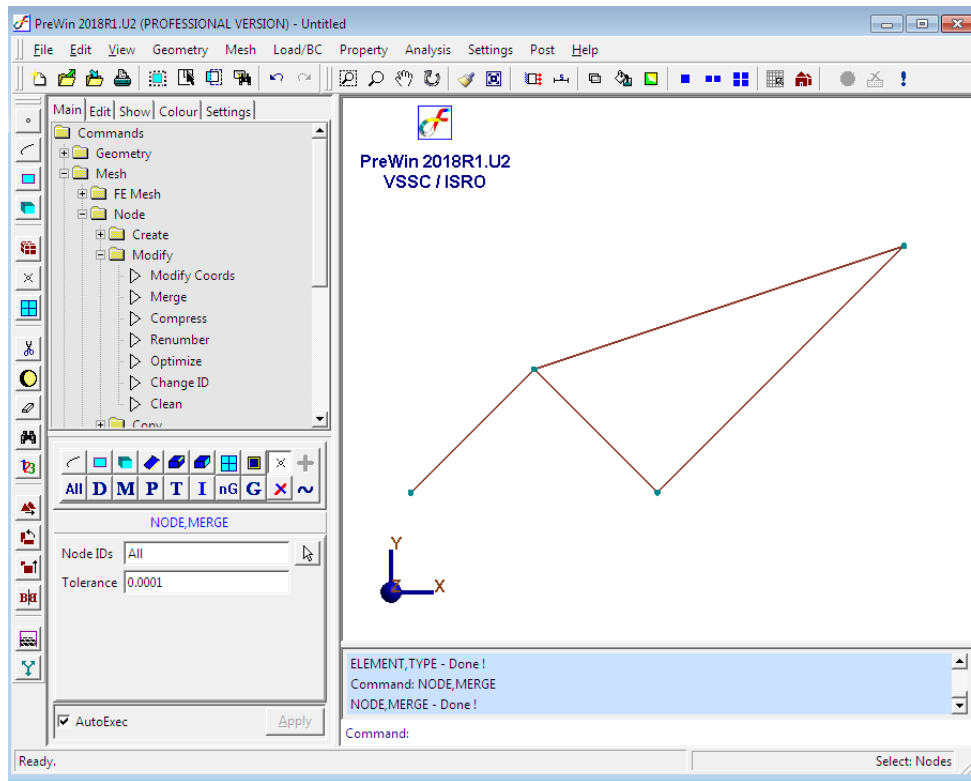
Element IDs	All
Element Type	Rod



5. Merge duplicate nodes.

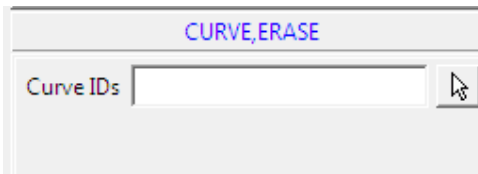
- Commands : NODE, MERGE
 Menu : Mesh → Node → Modify → Merge
 Parameters :

Element IDs	All
Tolerance	0.0001



6. Erase Curve (Optional)

- Commands : CURVE, ERASE
- Menu : Geometry → Curve → Miscellaneous → Erase
- Parameters :



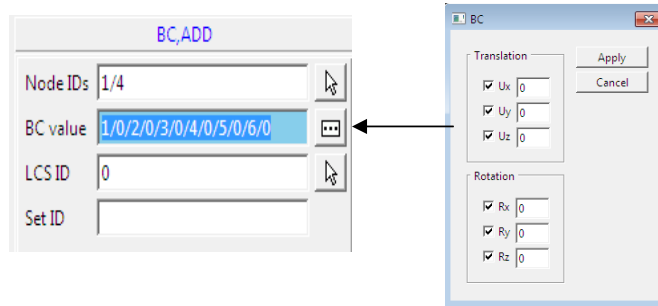
Note:

Likewise erase key points by POINT, ERASE, ALL command.

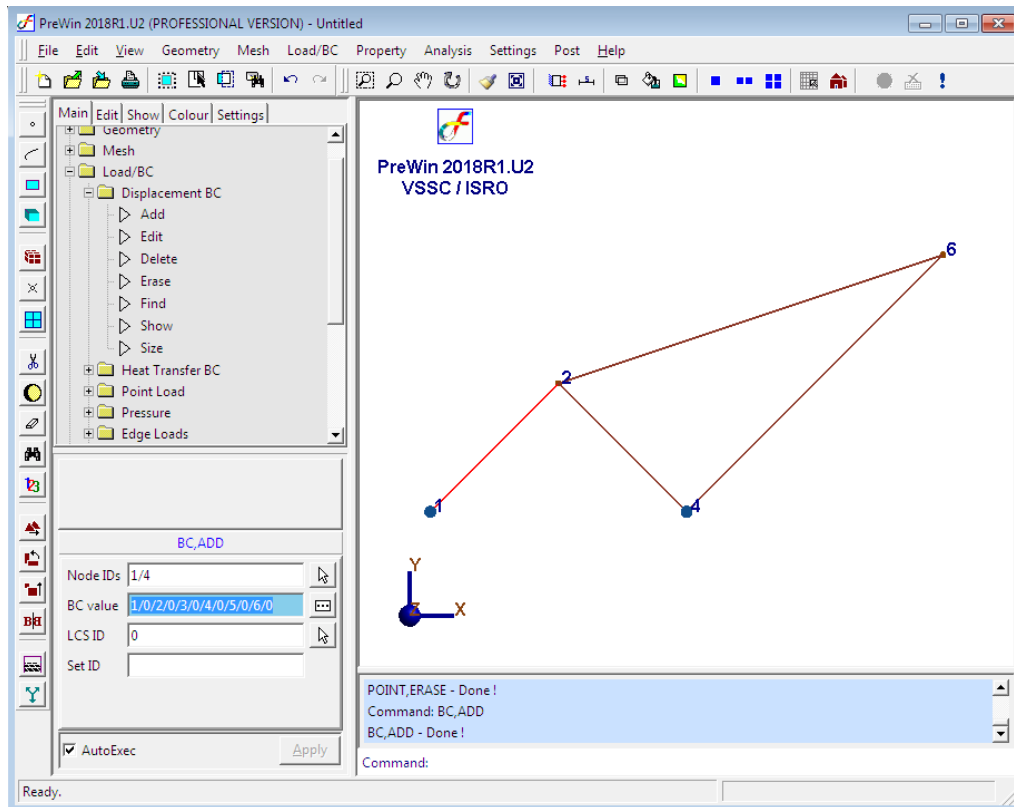
7. Specify displacement boundary conditions

- Commands : BC, ADD
- Menu : Load/BC → Displacement BC → Add
- Parameters :

Node IDs	Select the node at the points A and B
BC Value	1/0/2/0/3/0/4/0/5/0/6/0
LCS ID	0



At the end of the operation/s your screen should look like this.



8. Specify material properties

Command : MATERIAL, ISO

Menu : Property → Material → Isotropic → Add

Parameters :

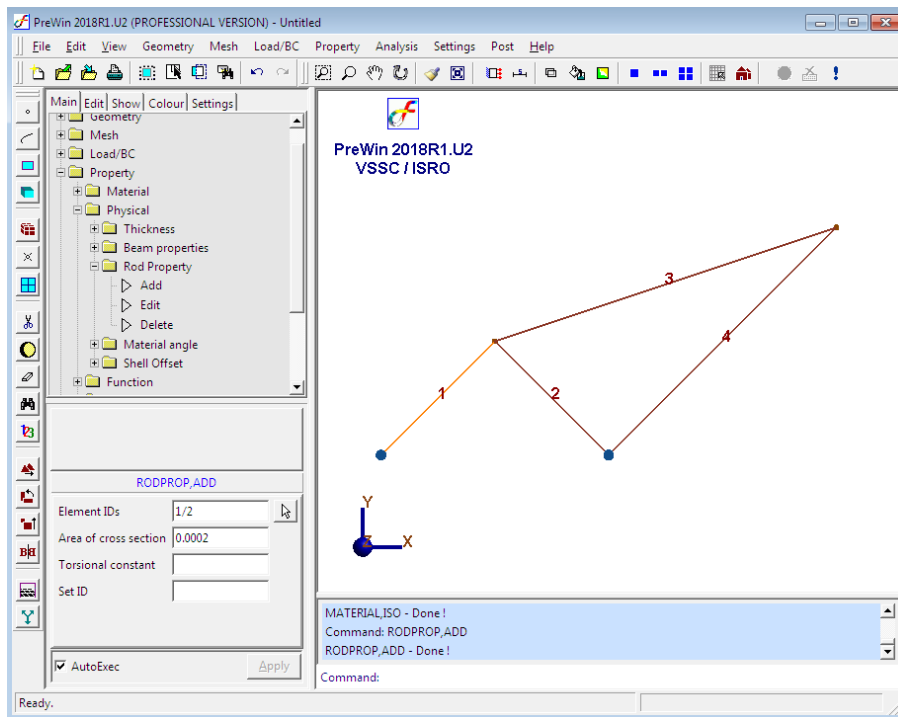
Element IDs	All
Material Data	2.1E+11/0.3/0/7850/0
Material ID	1

9. Specify Rod Properties

- Command : RODPROP, ADD
- Menu : Property → Physical → Rod Property → Add
- Parameters :

Element IDs	1/2
Area of cross section	0.0002
Torsional Constant	
Set ID	1

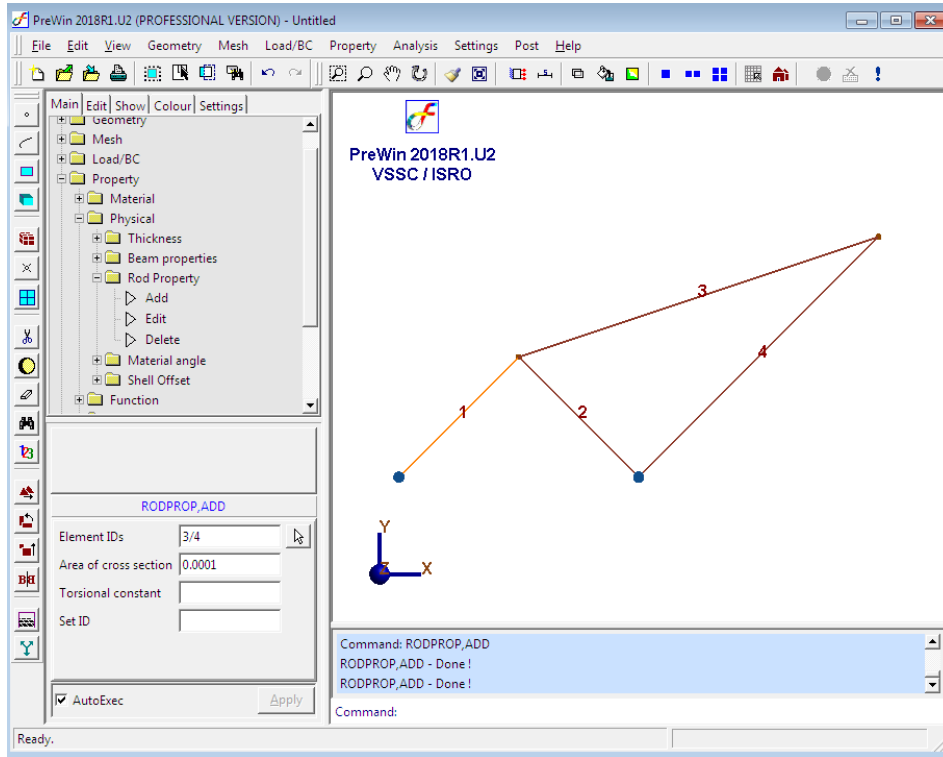
At the end of the operation/s your screen should look like this.



similarly specify the rod properties for elements 3 and 4

- Command : RODPROP, ADD
- Menu : Property → Physical → Rod Property → Add
- Parameters :

Element IDs	3/4
Area of cross section	0.0001
Torsional Constant	
Set ID	2

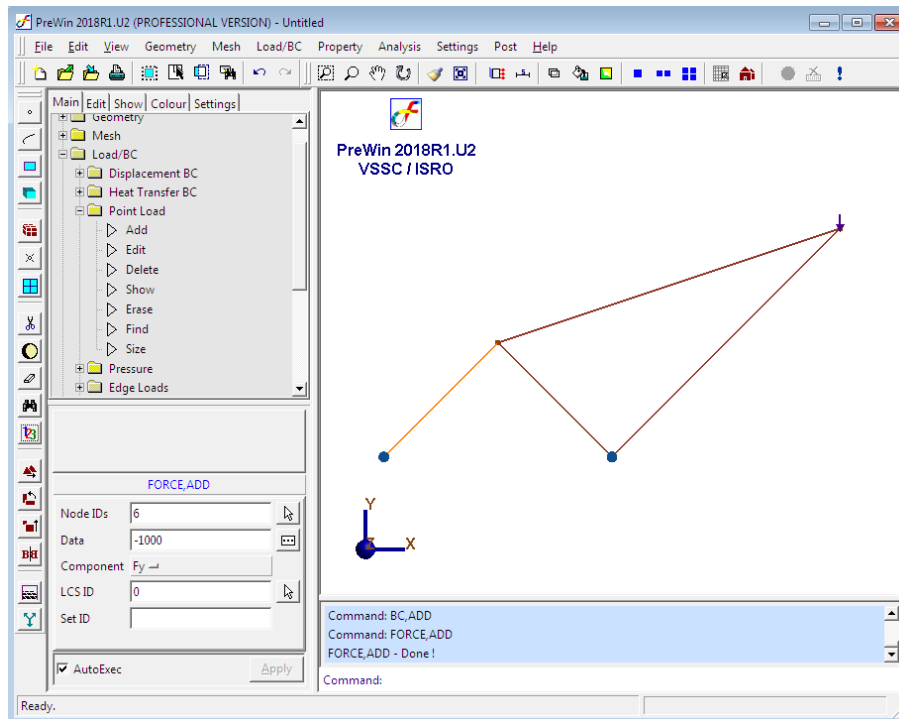


10. Specify point load

- Command : FORCE, ADD
- Menu : Load/BC → Point Load → Add
- Parameters :

Node IDs	6
Data	-1000
Component	F _y
LCS ID	0
Set ID	1

At the end of the operation/s your screen should look like this.



11. Set the analysis type

Command : ANTYPE, SET
 Menu : Analysis → Analysis Type
 Parameters :

Analysis Type	Static
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12. Set the analysis options

Command : ANOPTION, SET
 Menu : Analysis → Analysis Options
 Parameters :

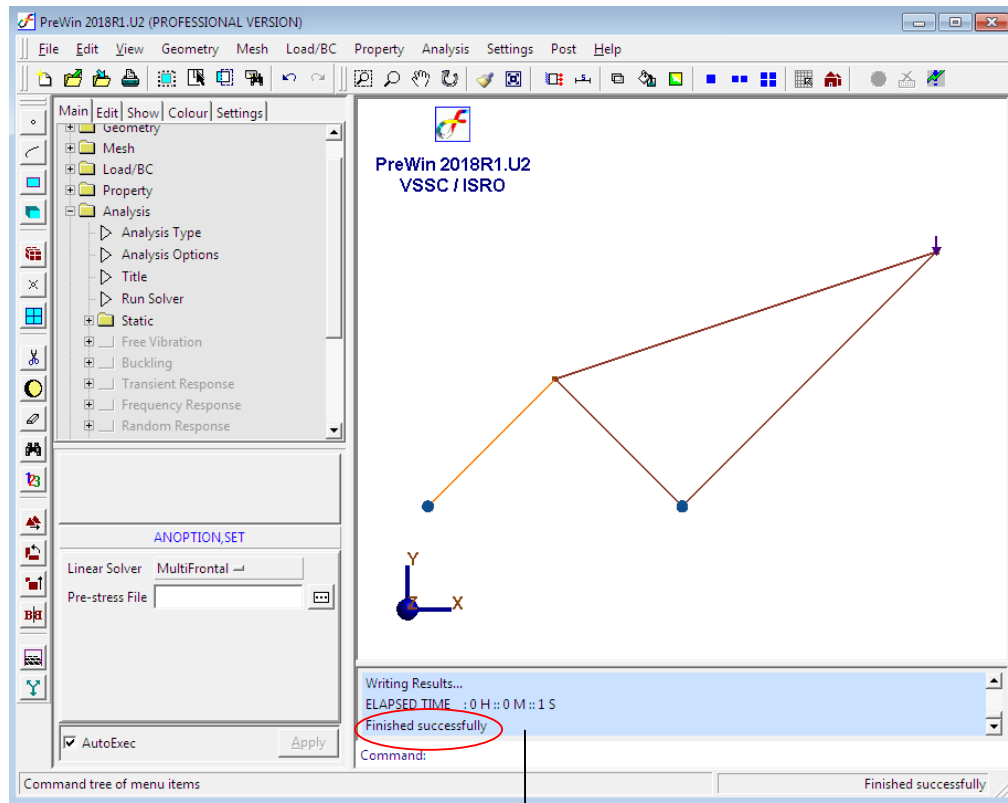
Linear Solver	Multi Frontal
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13. Save the project model

Menu : File → Save

14. Submit the job into FEAST

Menu : Analysis → Run solver



Note:

Message box

"Finished successfully" message appears on message box after executing is completed.

15. Perform post processing

i) Deformed shape

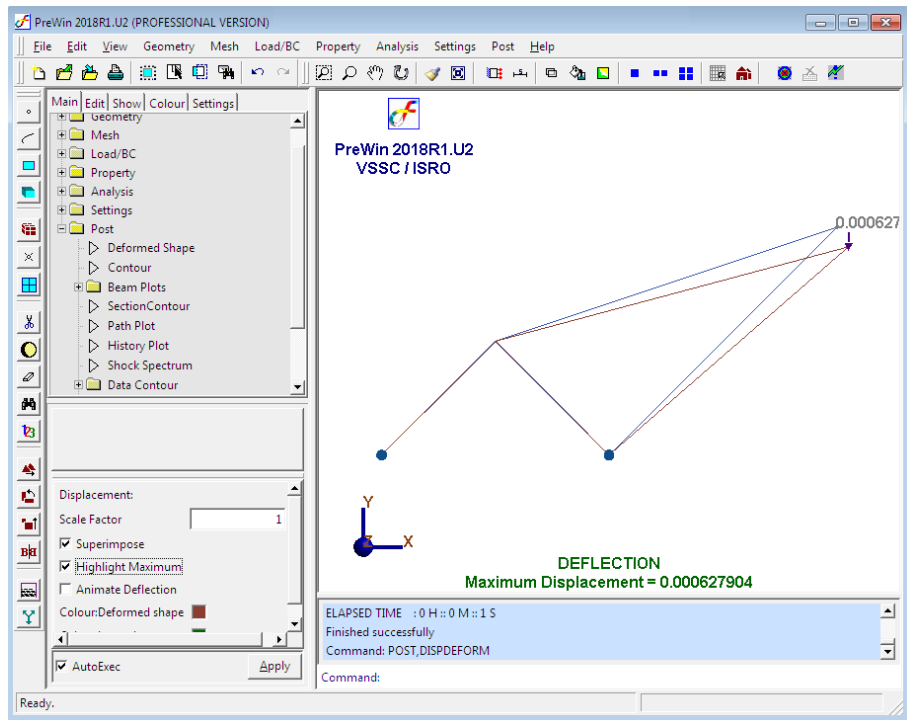
Command : POST, DISPDEFORM

Menu : Post → Deformed shape

Parameters :

Scale factor	1
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At the end of the operation/s your screen should look like this.



- ii. *.DAT file shows the input data and *.OUT file shows the output file.