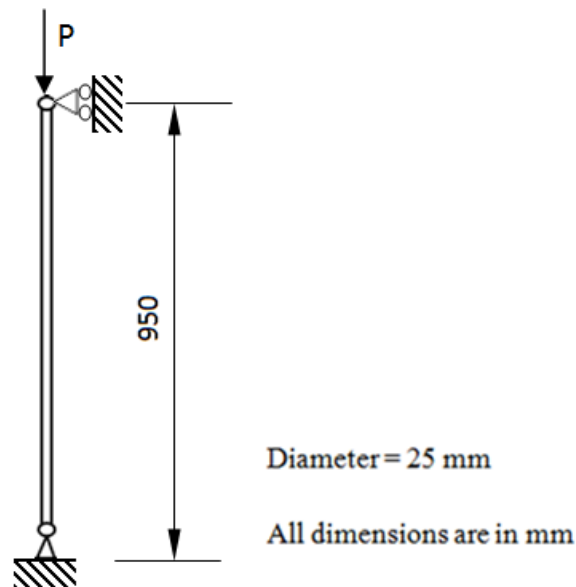


BUCKLING ANALYSIS OF A BEAM



Buckling analysis of a beam subjected to a load P as shown in figure. The compression member is pinned at both the ends. Material property; $E = 207 \text{ GPa}$, $\nu = 0.3$. Using Euler's formula for long columns find the critical load and use a design factor $N = 3$ to find P .

Euler's formula for critical load, $P_{cr} = \frac{n^2 \pi^2 EI}{L_e^2}$

Where n = mode number

E = Young's modulus

I = Moment of inertia

L = Effective length

Hence $P_{cr} = 43.4 \text{ kN}$

Considering design factor $N = 3$, $P = 14.5$

PROCEDURE

1. Create key points

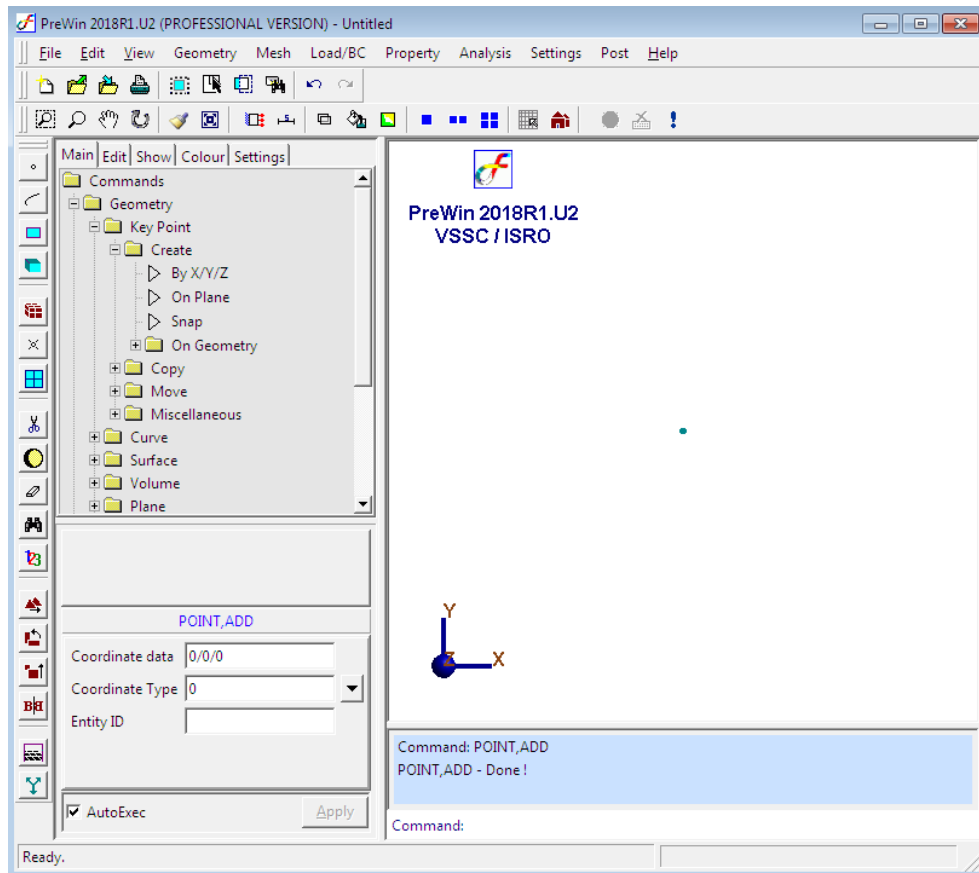
Command : POINT,ADD

Menu : Geometry → Keypoint → Create → By X/Y/Z

Parameters :

Coordinate data	0/0/0
Coordinate type	0
Entity ID	

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



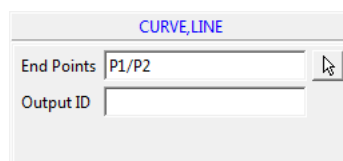
Similarly create a point at (0/950/0)

2. Create curve

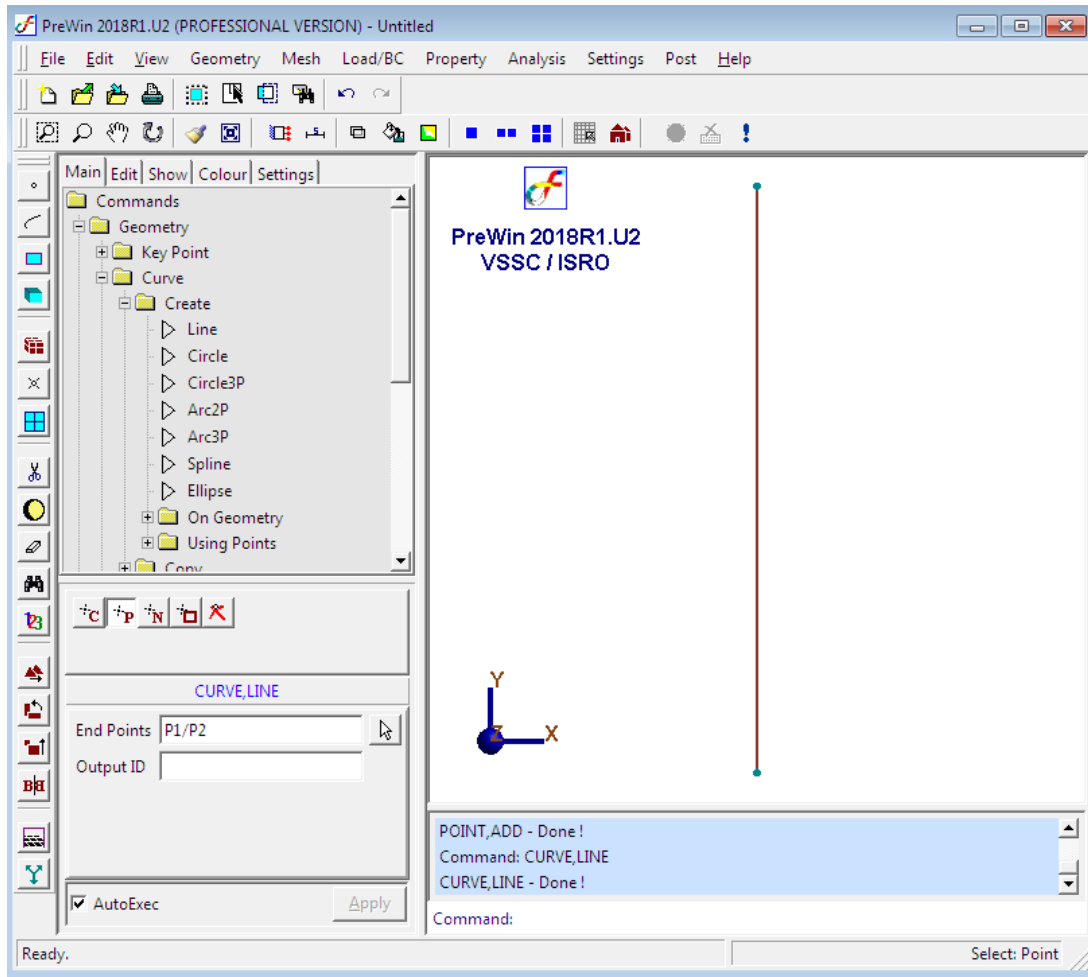
Command : CURVE,LINE

Menu : Geometry → Curve → Create → Line

Parameters :



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



3. Generate mesh

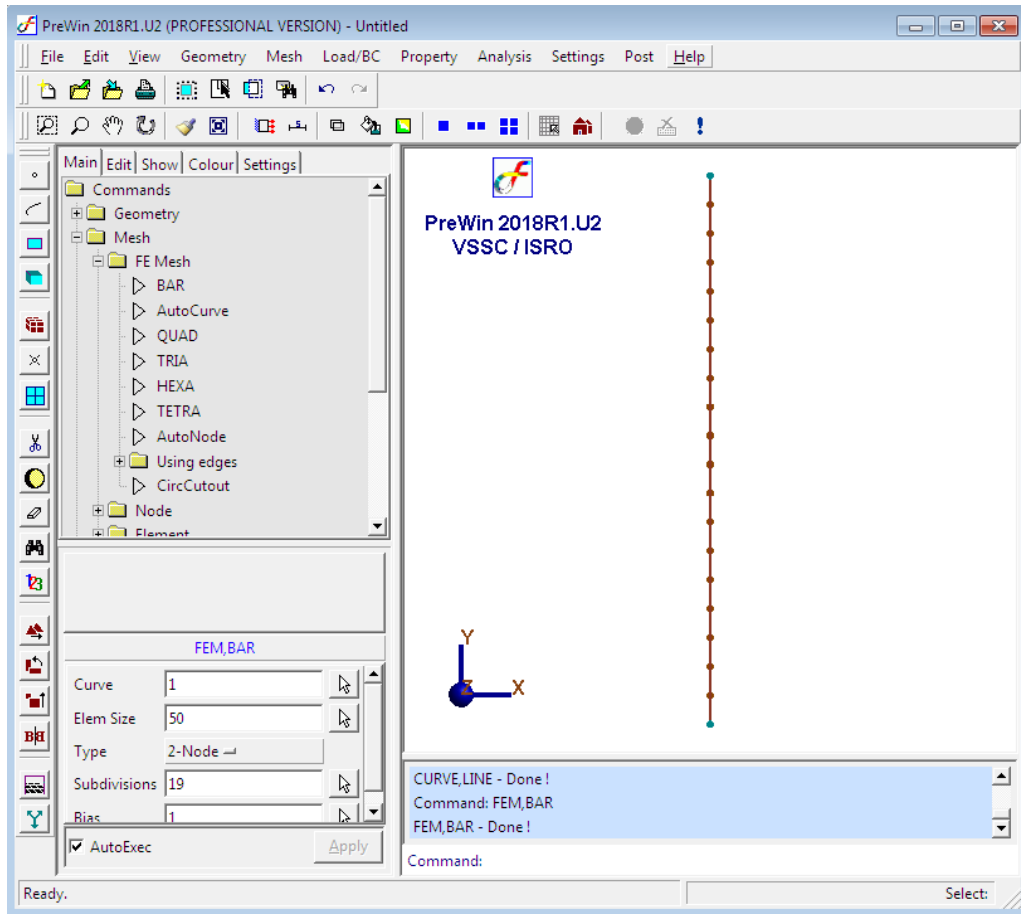
Command : FEM,BAR

Menu : Mesh → FE Mesh → Bar

Parameters :

FEM,BAR	
Curve	1
Elem Size	50
Type	2-Node
Subdivisions	19
Bias	

At the end of the above operation your screen should like this

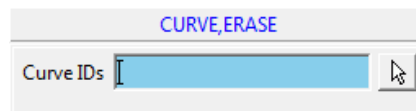


4. Erase curve

Command : CURVE,ERASE

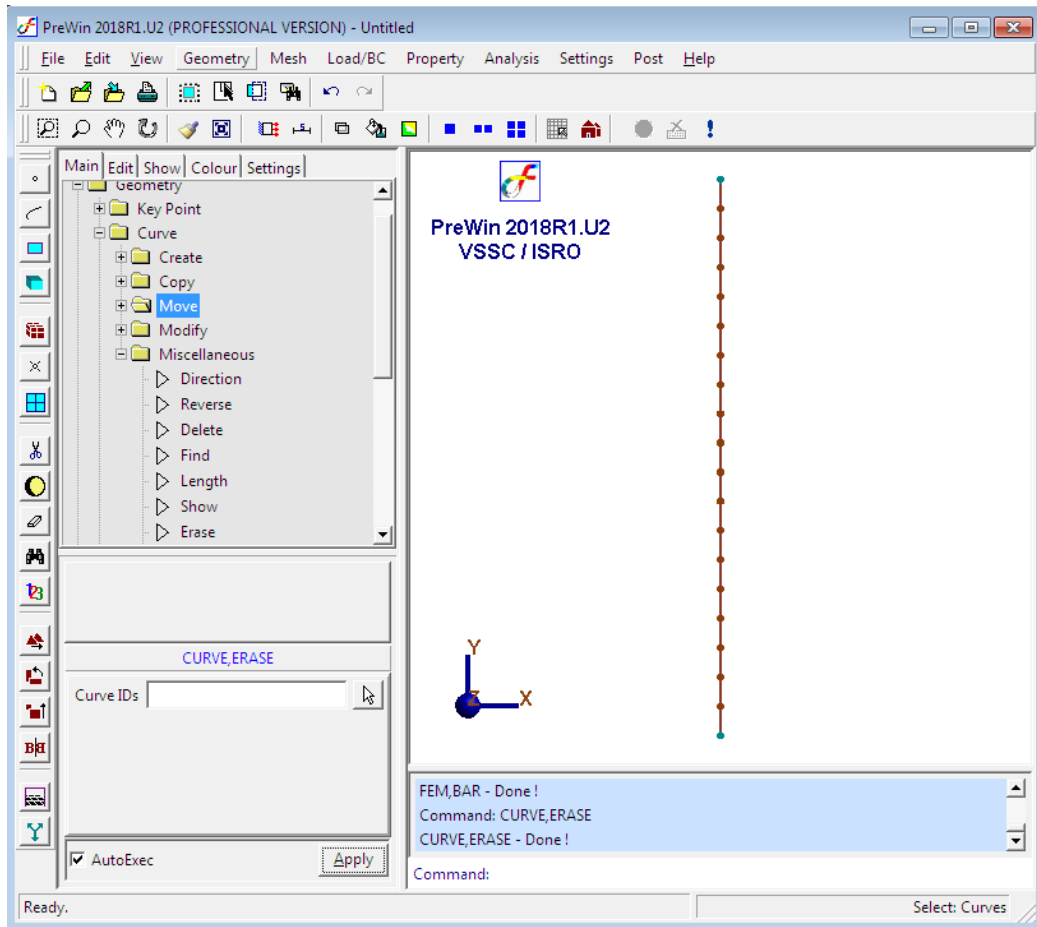
Menu : Geometry → Curve → Miscellaneous → Erase

Parameters :



Enter the curve ID in the box or pick the curve using mouse pointer.

At the end of the above operation your screen should like this

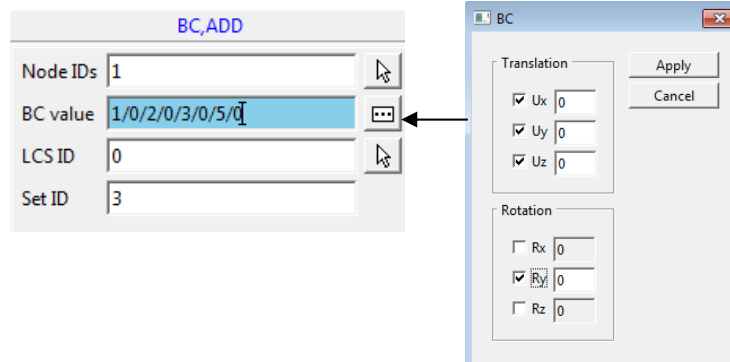


5. Apply boundary condition

Command : BC,ADD

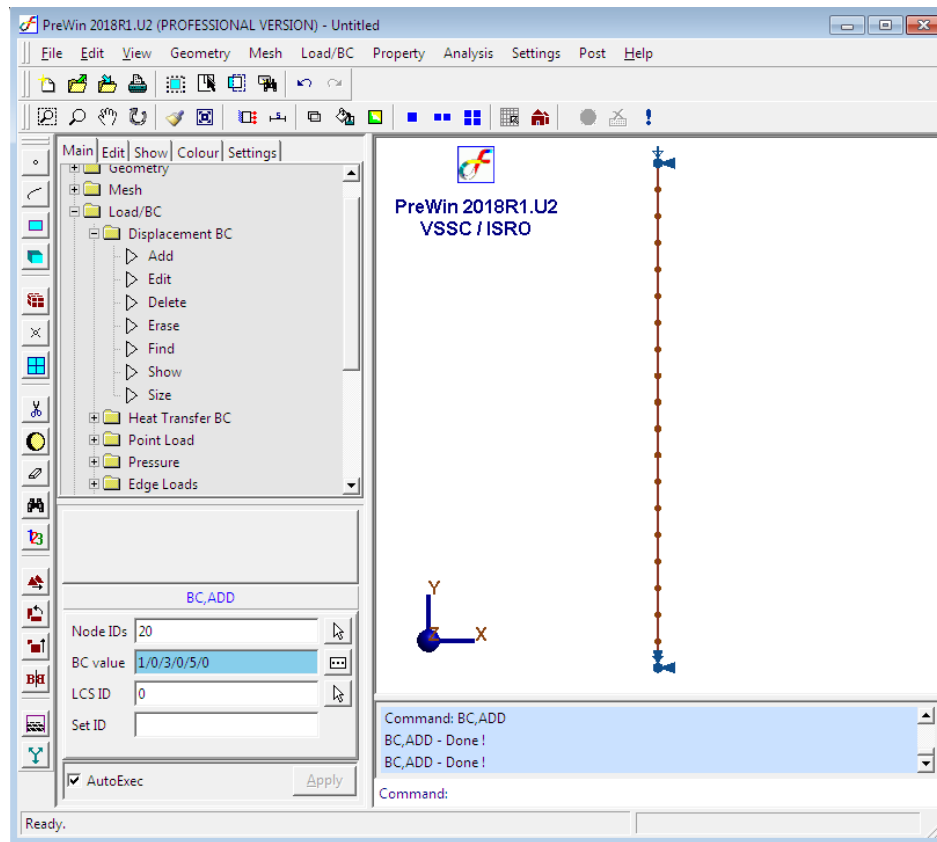
Menu : Load/BC → Displacement BC → Add

Parameters :



Similarly at the top end apply BC as (1/0/3/0/5/0)

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

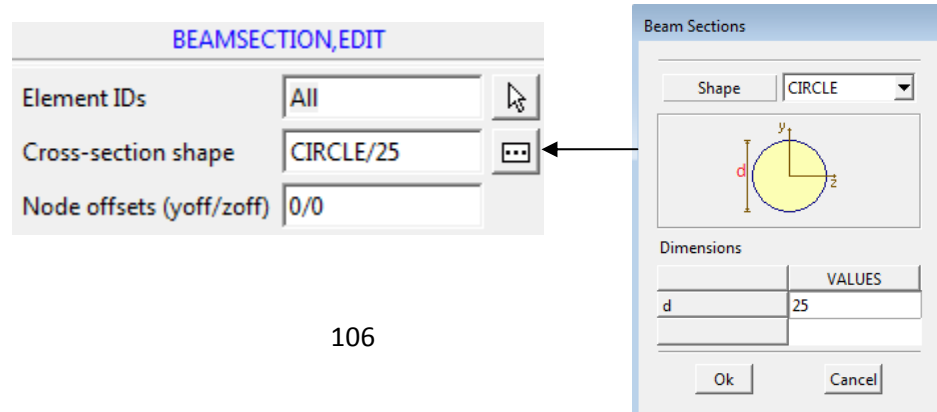


6. Apply beam property

Command : BEAMSECTION,ADD

Menu : Property → Physical → Beam Properties → Standard Section → Add

Parameters :

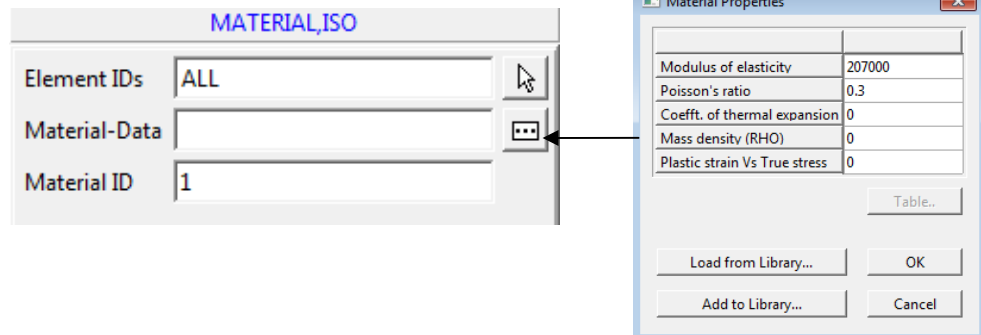


7. Apply material property

Command : MATERIAL,ISO

Menu : Property → Material → Isotropic → Add

Parameters :

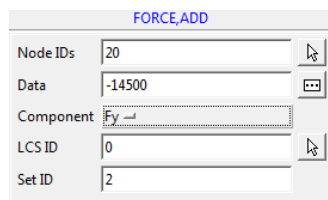


8. Specify load

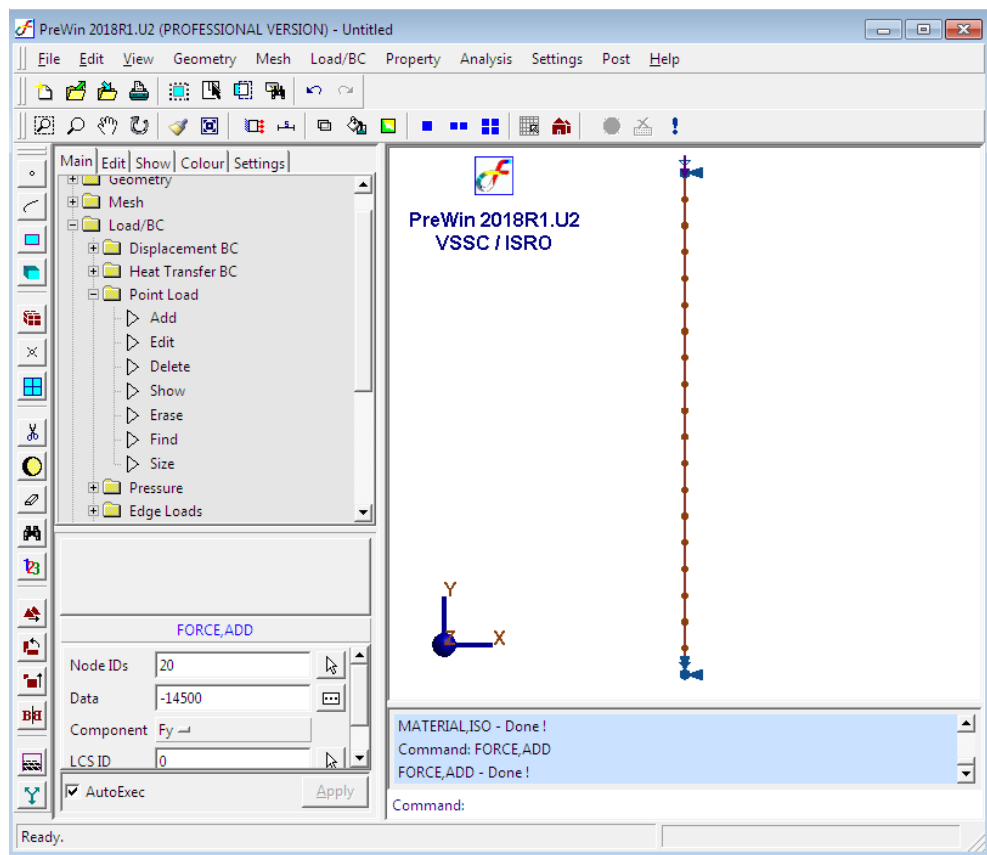
Command : FORCE,ADD

Menu : Load/BC → Point Load → Add

Parameters :



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



9. Set Analysis Type

Command : ANTYPE,SET

Menu : Analysis → Analysis Type

Parameters :

ANTYPE,SET	
Analysis Type	Buckling

10. Specify buckling general data

Command : BUCKLING,ADD

Menu : Analysis → Buckling → General → Add

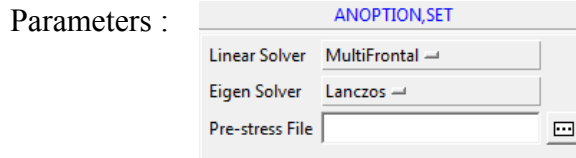
Parameters :

BUCKLING,ADD	
No. of eigen values	20
Stress output	Yes

11. Set analysis Option

Command : ANOPTION,SET

Menu : Analysis → Analysis Option



12. Save the project model

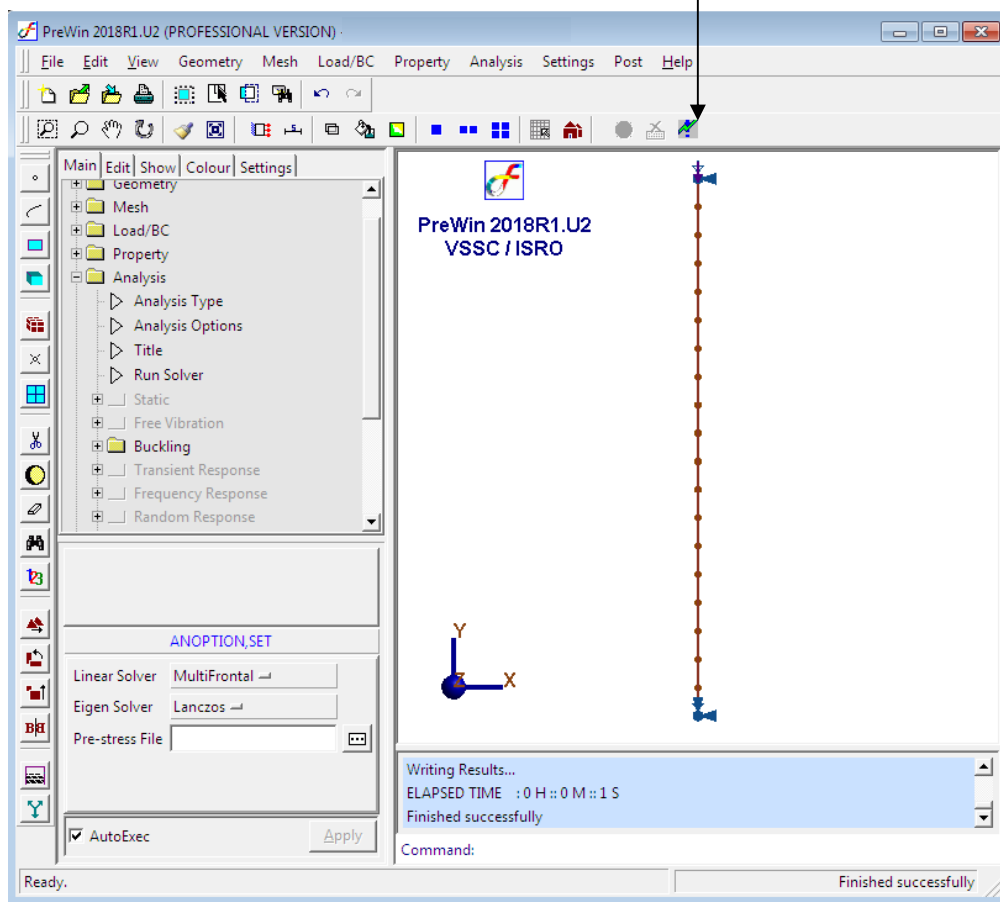
Menu : File → Save

Save the file to desired directory

13. Submit the job in to FEAST

Menu: **Analysis** → Run Solver

Click here



1. Post Processing

i. Deformed shape

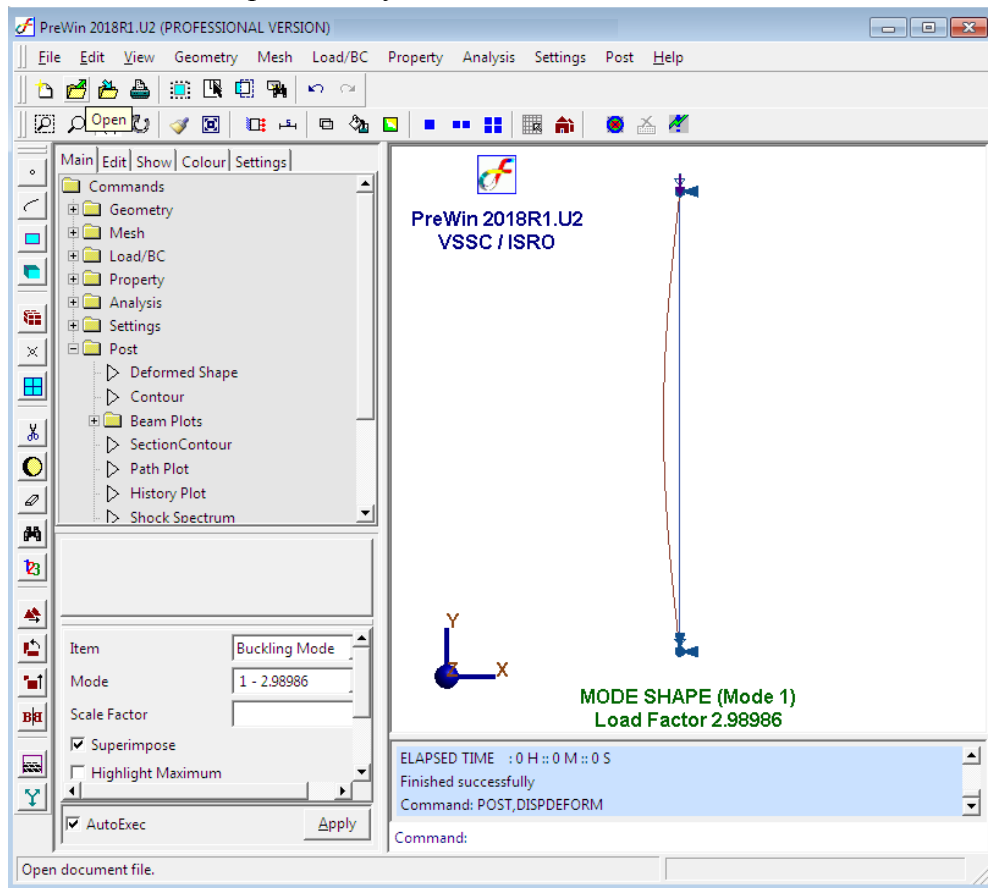
Command : POST,DISPDEFORM

Menu : Post → Deformed shape

Parameters :

Item	Buckling Mode
Mode	1 - 2.98986
Scale Factor	1
<input checked="" type="checkbox"/> Superimpose	
<input type="checkbox"/> Highlight Maximum	
<input type="checkbox"/> Animate Mode	
Colour:Deformed shape	■
Colour:Legend	■

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



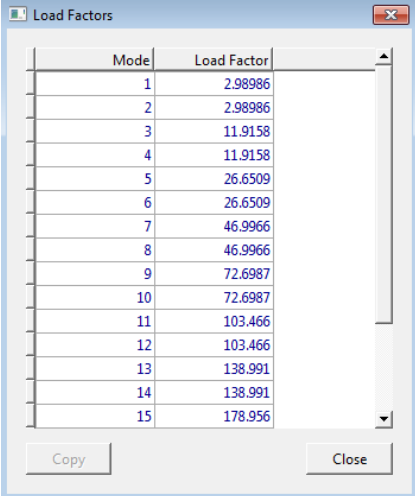
ii. View results

Command : POST,VIEWRESULTS

Menu : Post → View Results

Parameters :

The following table will be displayed



Mode	Load Factor
1	2.98986
2	2.98986
3	11.9158
4	11.9158
5	26.6509
6	26.6509
7	46.9966
8	46.9966
9	72.6987
10	72.6987
11	103.466
12	103.466
13	138.991
14	138.991
15	178.956

Output file can be seen in *.OUT