

# Nedjelja 3

## Modeliranje grednih konstrukcija konačnim elementima

# Postavka zadatka

Gredna konstrukcija prikazana na slici je izrađena od čeličnih I profila (356x171x51). Odrediti deformacije i napone konstrukcije na koju djeluje kontinuirano opterećenje od  $q=50$  kN/m kao na slici.

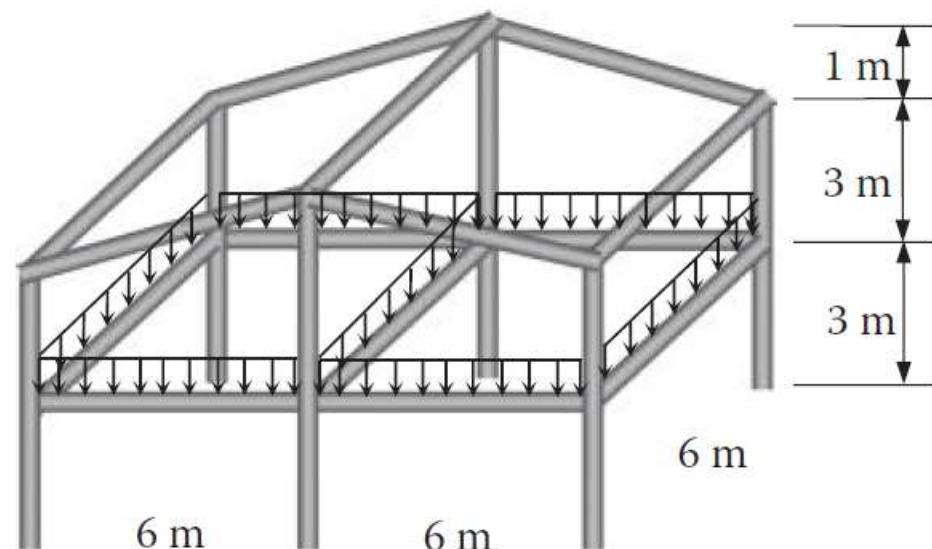
**BRITISH STEEL** Sections  
Universal Beams (UB)  
Dimensions and properties

British Steel, the only UK manufacturer of structural sections, is BES 6001 certified, guaranteeing commitment to responsibly sourced materials. Our structural sections are CE marked and tested to the highest standards, providing quality and assurance for the UK construction market.

Universal Beams (UB) sizes

Designation	Mass per metre	Depth of section	Width of section		Thickness of web	Root radius	Depth between fillets	Ratios for local buckling		Second moment of area		Radius of gyration	
			D	B				Flange	Web	Axis	Axis	Axis	Axis
Serial size	kg/m	mm	mm	mm	mm	mm	mm	B/2T	d/t	x-x	y-y	x-x	y-y
356 x 171 x 51	51.0	355.0	171.5	74	11.5	12.7	306.6	7.46	41.4	14265	969	14.80	3.85

355.0 171.5 7.4 11.5



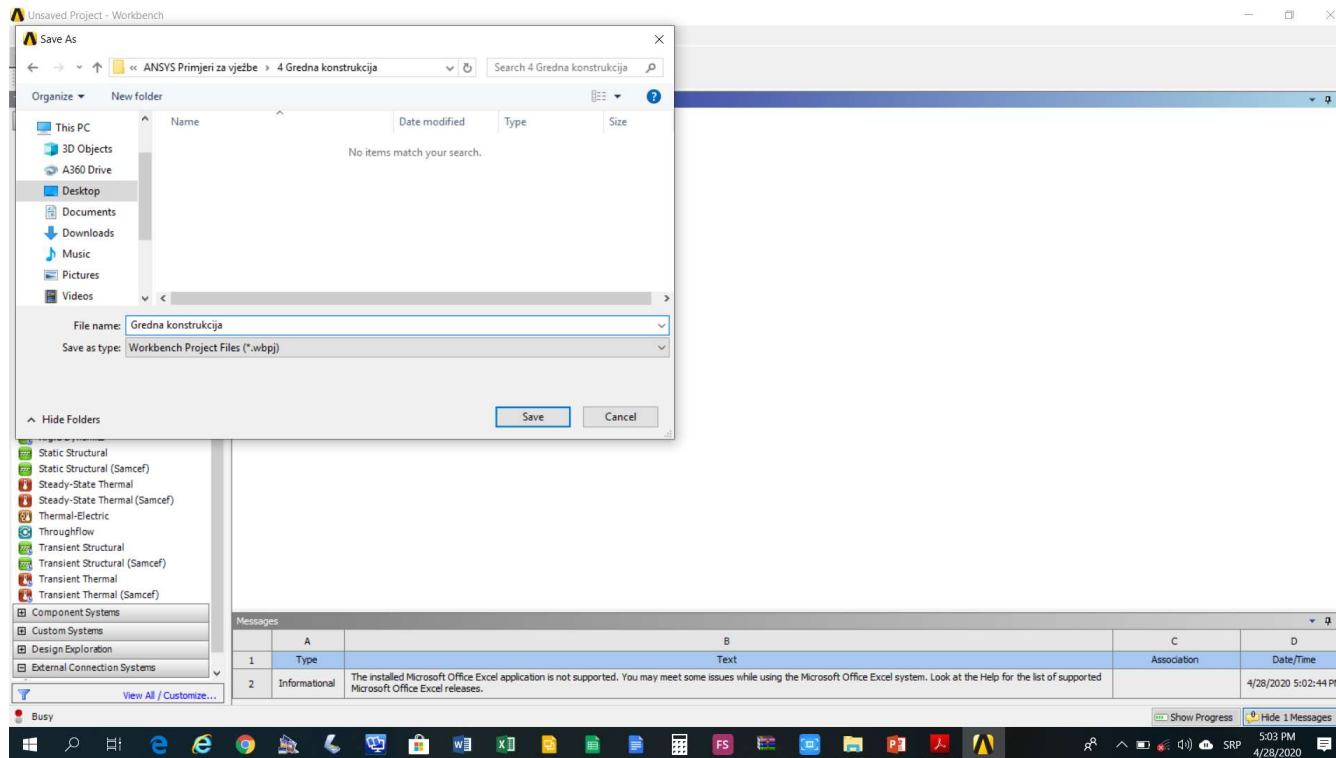
# Noseća konstrukcije mosta

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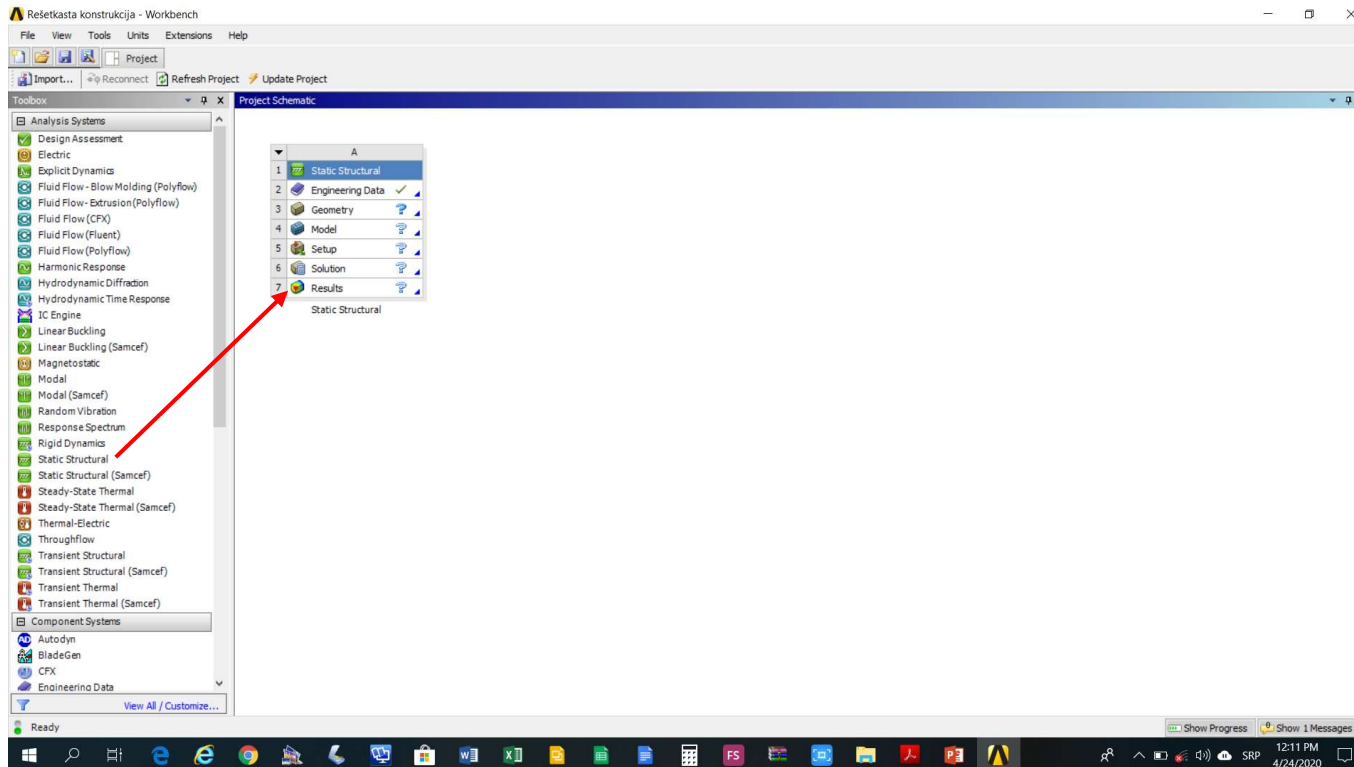
# Modeliranje gredne konstrukcije

Aktivirati program ANSYS i sačuvati prazan projekat pod nazivom Gredna konstrukcija



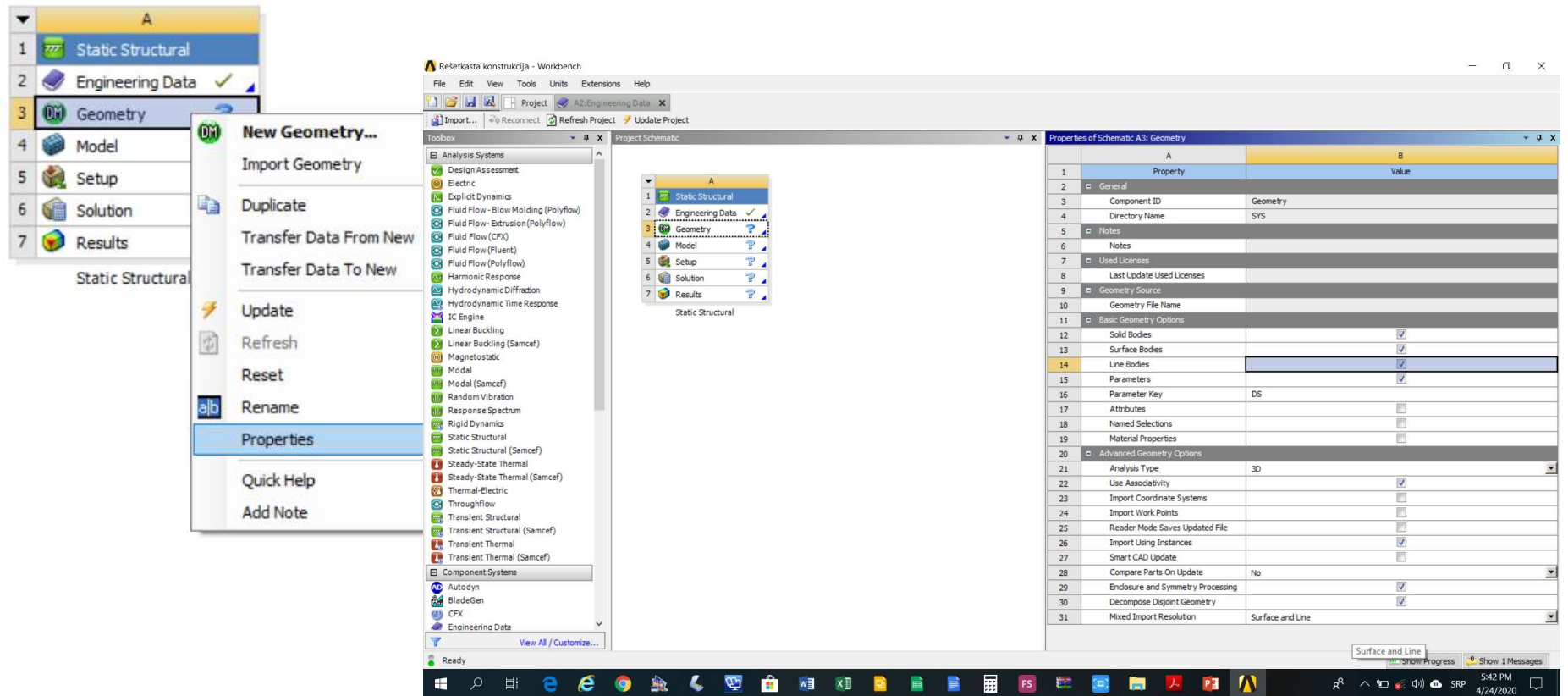
# Modeliranje gredne konstrukcije

Kreirati statičku linearnu analizu (*Static Structural*) na shemi projekta (*Project Schematic*)



# Modeliranje gredne konstrukcije

Izvršiti podešavanja modula Design Modeler  
(*Geometry*->*Properties*->*Line Bodies = On*)

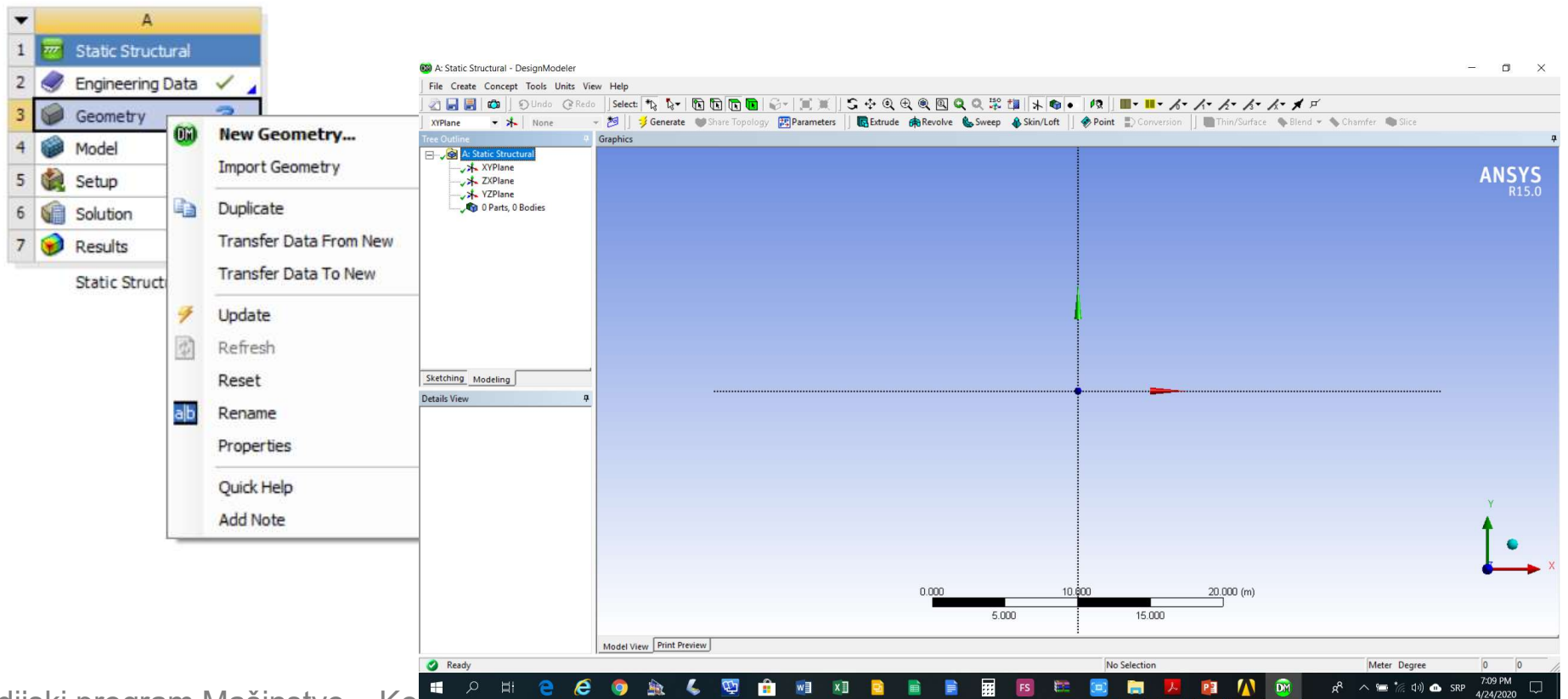


The screenshot displays the ANSYS Workbench interface. On the left, the 'Properties' dialog for the 'Geometry' component is open, showing various options. The 'Line Bodies' checkbox is checked. The main window shows the 'Project Schematic' with the 'Geometry' component selected. The 'Properties of Schematic A3: Geometry' table is visible on the right.

Property	Value
Component ID	Geometry
Directory Name	SYS
Notes	
Used Licenses	
Last Update Used Licenses	
Geometry Source	
Geometry File Name	
Basic Geometry Options	
Solid Bodies	<input checked="" type="checkbox"/>
Surface Bodies	<input checked="" type="checkbox"/>
Line Bodies	<input checked="" type="checkbox"/>
Parameters	<input checked="" type="checkbox"/>
Parameter Key	DS
Attributes	<input type="checkbox"/>
Named Selections	<input type="checkbox"/>
Material Properties	<input type="checkbox"/>
Advanced Geometry Options	
Analysis Type	3D
Use Associativity	<input checked="" type="checkbox"/>
Import Coordinate Systems	<input type="checkbox"/>
Import Work Points	<input type="checkbox"/>
Reader Mode Saves Updated File	<input type="checkbox"/>
Import Using Instances	<input checked="" type="checkbox"/>
Smart CAD Update	<input type="checkbox"/>
Compare Parts On Update	No
Enclosure and Symmetry Processing	<input checked="" type="checkbox"/>
Decompose Disjoint Geometry	<input checked="" type="checkbox"/>
Mixed Import Resolution	Surface and Line

# Modeliranje gredne konstrukcije

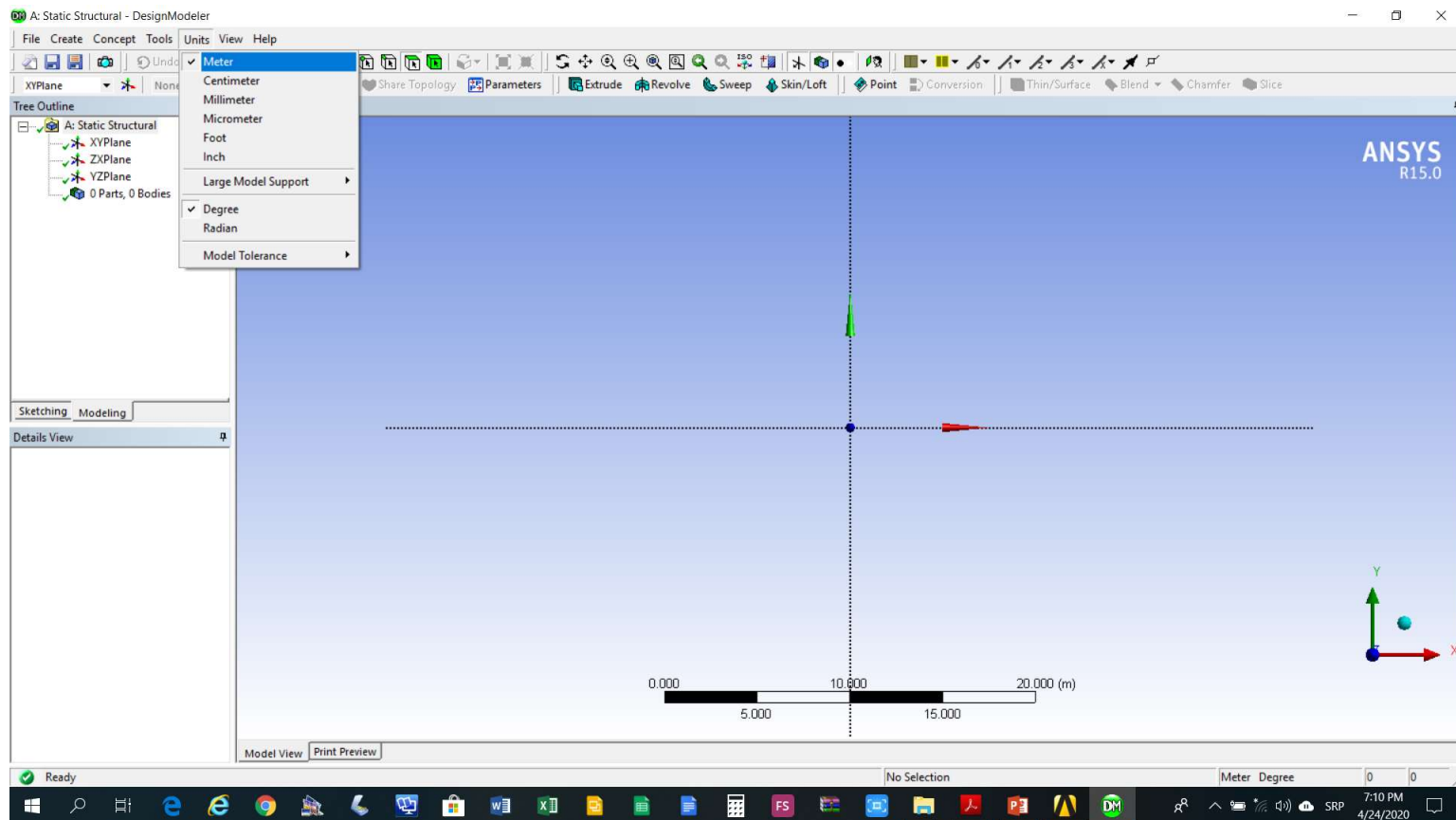
Aktivirati modul Design Modeler (*Geometry->New Geometry*)





# Modeliranje gredne konstrukcije

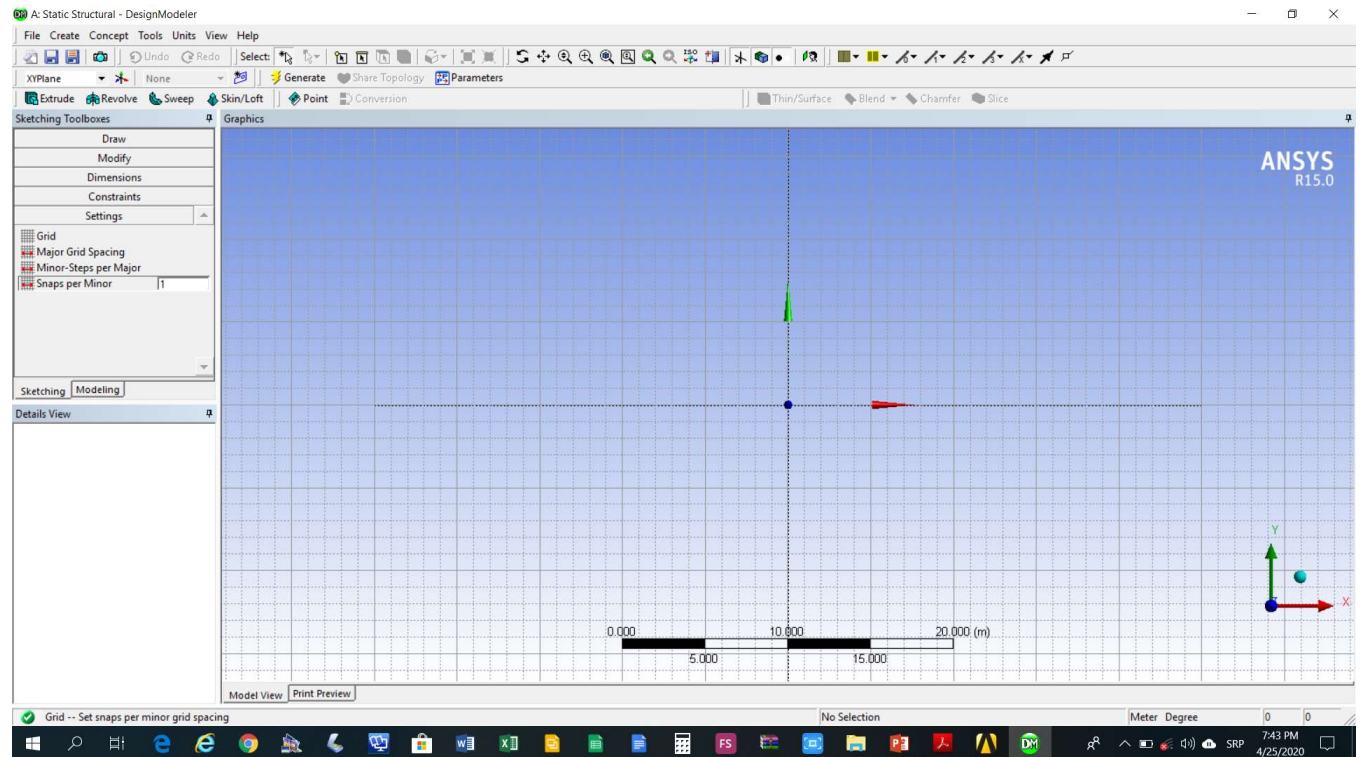
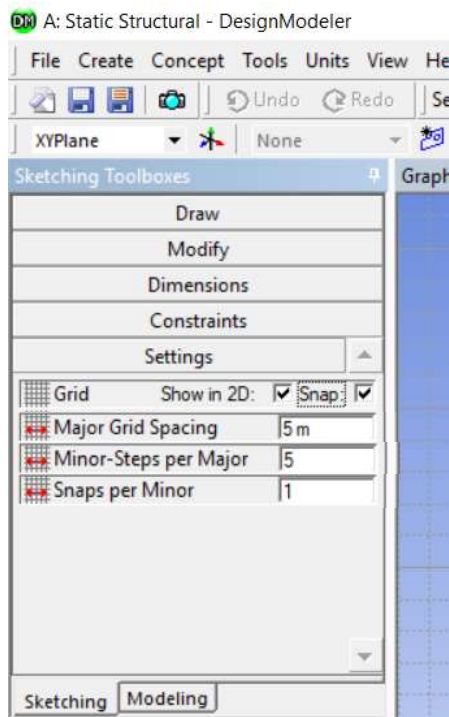
Podesiti dužinske jedinice (Units->Meter)





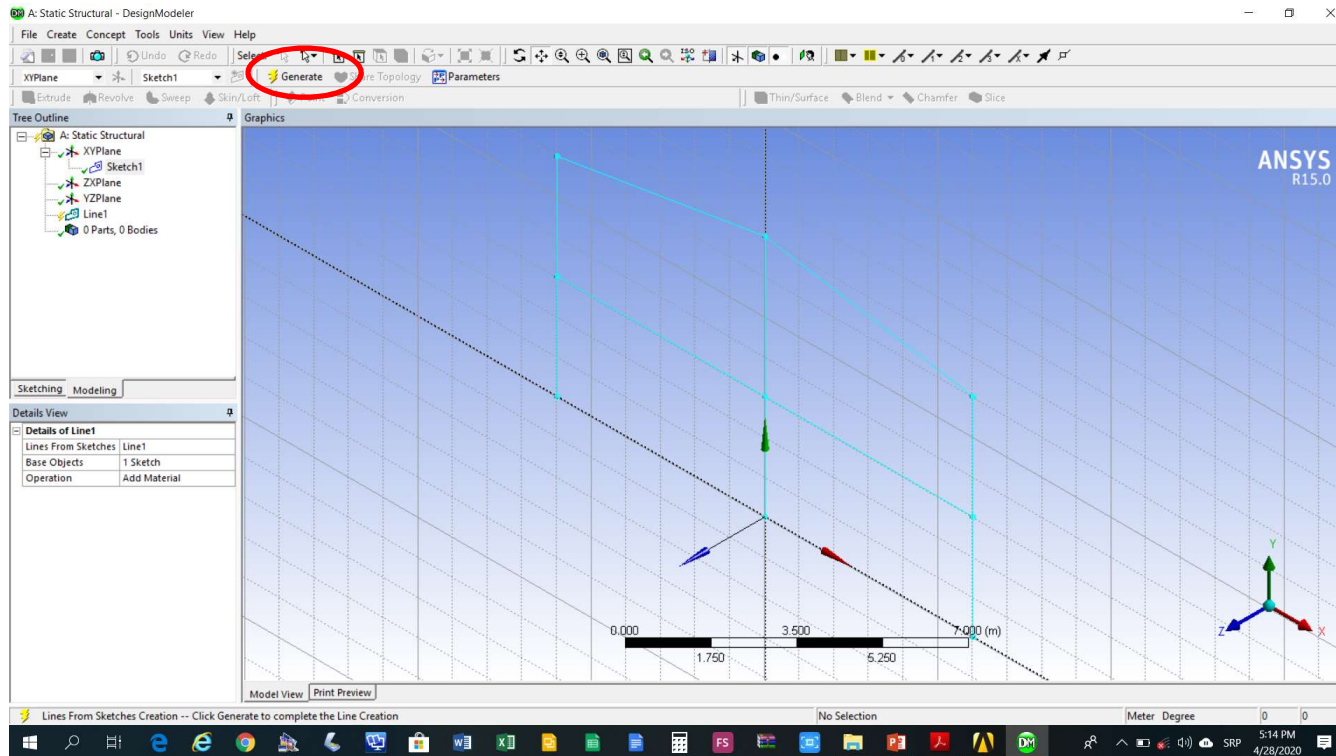
# Modeliranje gredne konstrukcije

Podesiti parametre mreže i skokovitog kretanja  
(*Sketching->Settings->Grid*) (*Show in 2D = On*)  
(*Snap = On*)



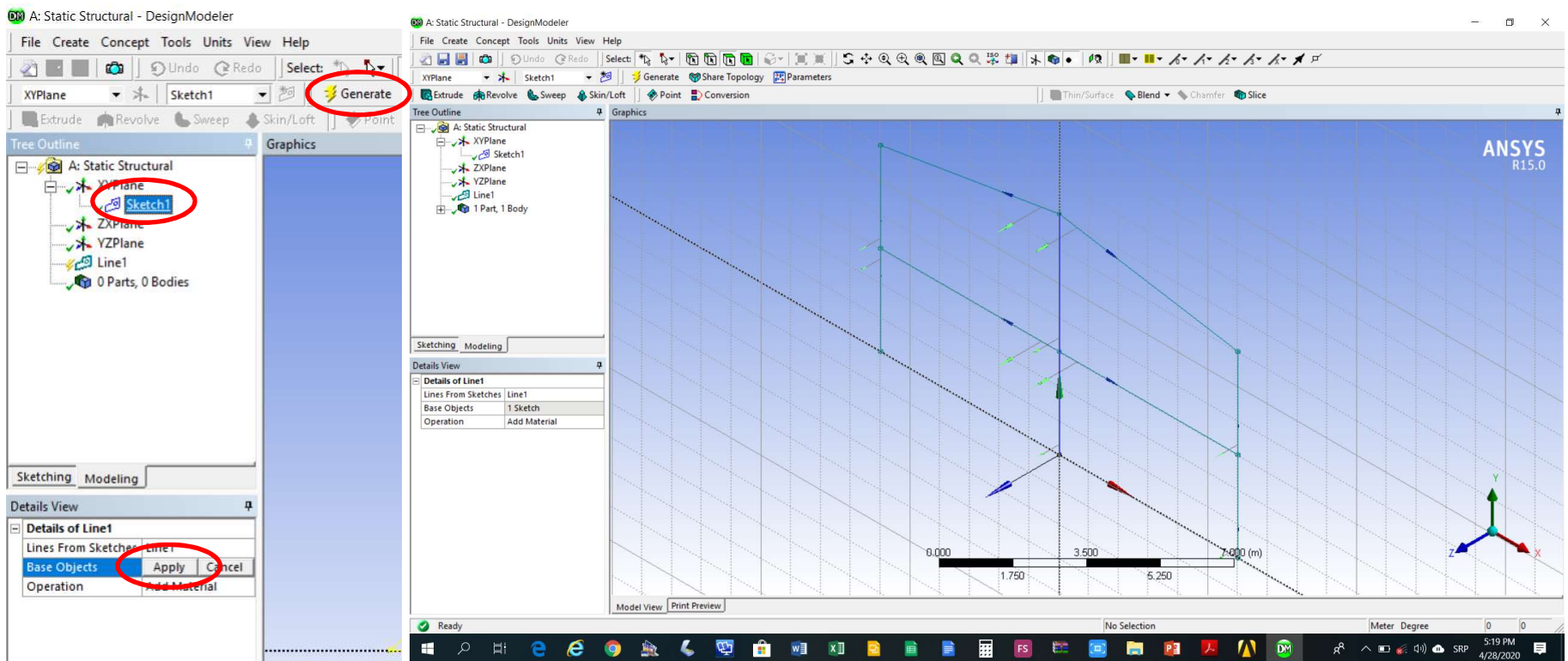
# Modeliranje gredne konstrukcije

Nacrtati konstrukciju (*Sketching*->*Draw*->*Line*)  
okončati crtanje skice komandom *Generate*



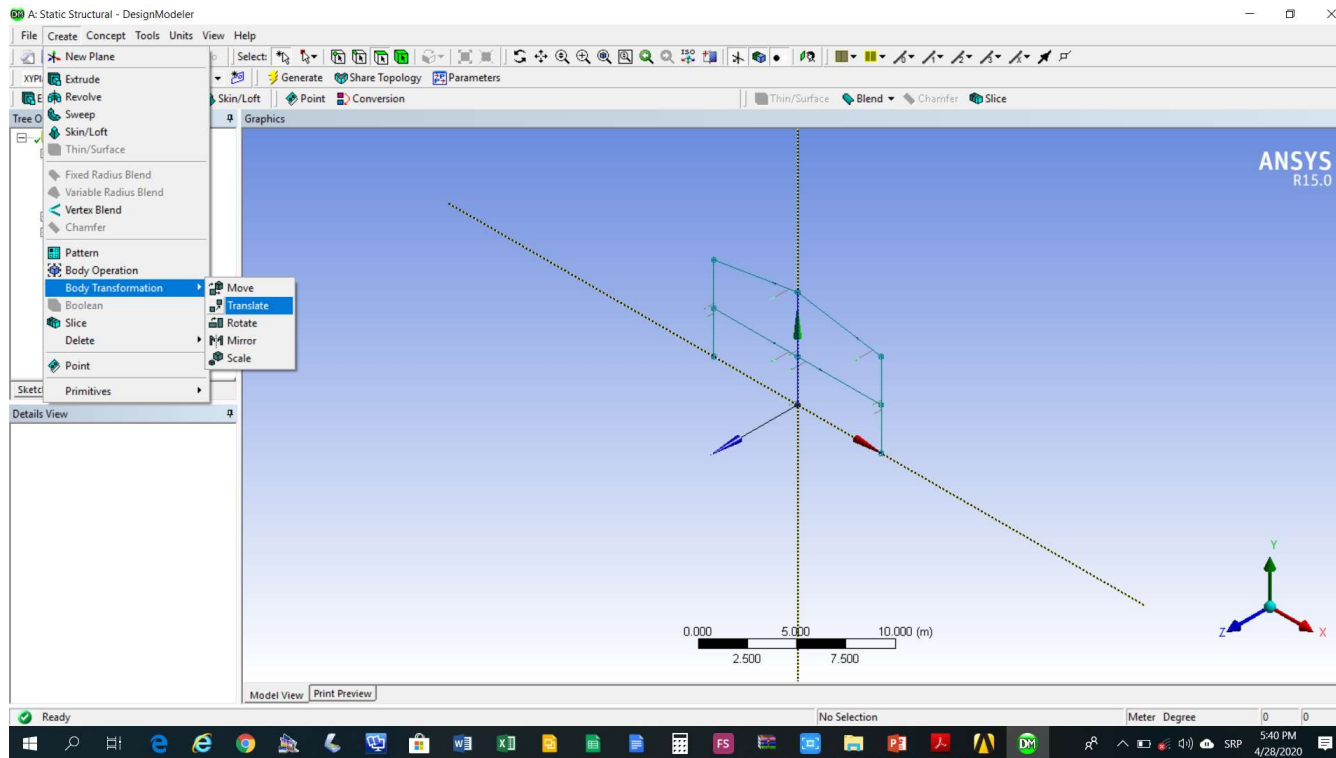
# Modeliranje gredne konstrukcije

Aktivirati opciju (*Concept*->*Lines from Sketches*)



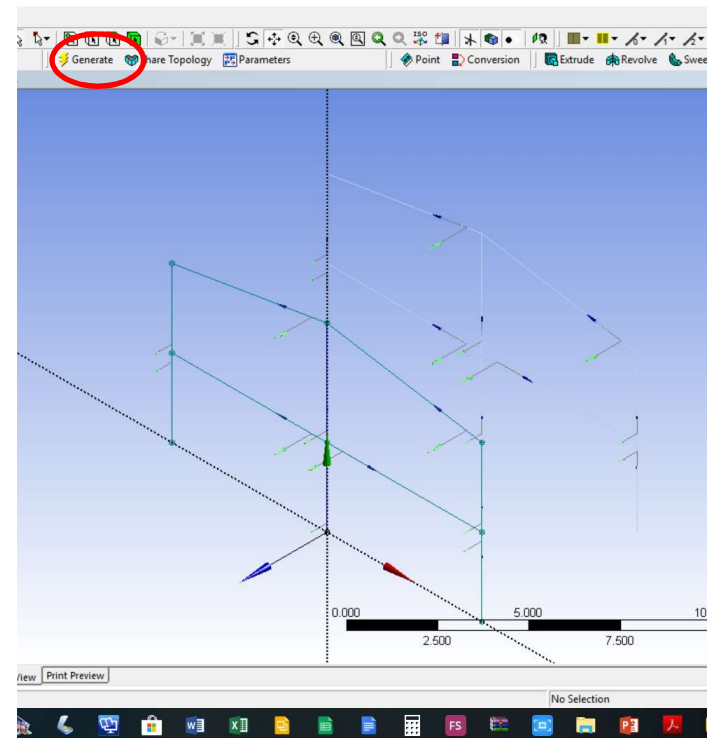
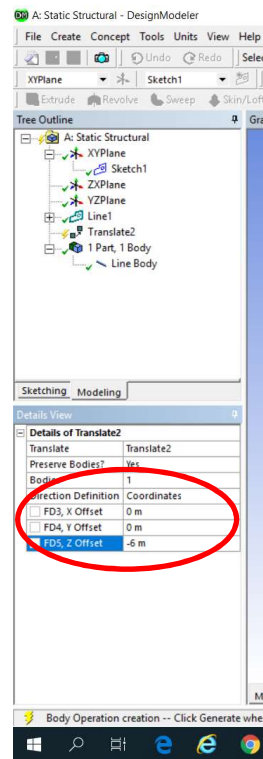
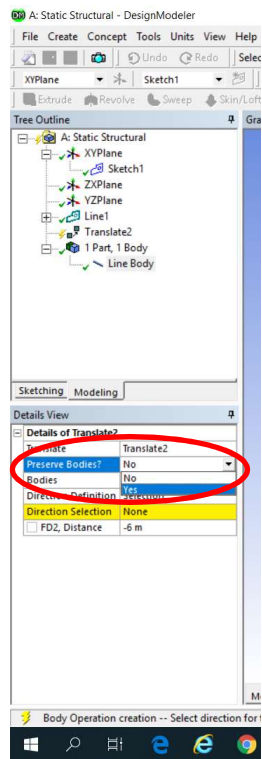
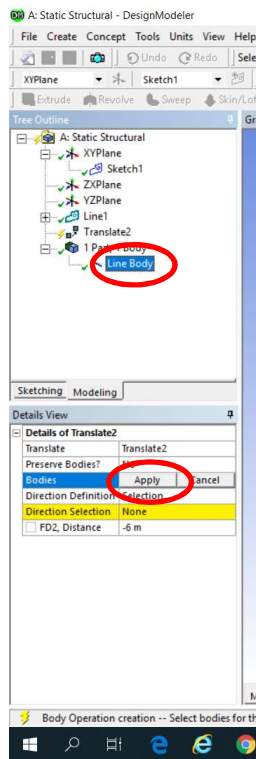
# Modeliranje gredne konstrukcije

Aktivirati opciju (*Create->Body Transformation->Translation*)



# Modeliranje gredne konstrukcije

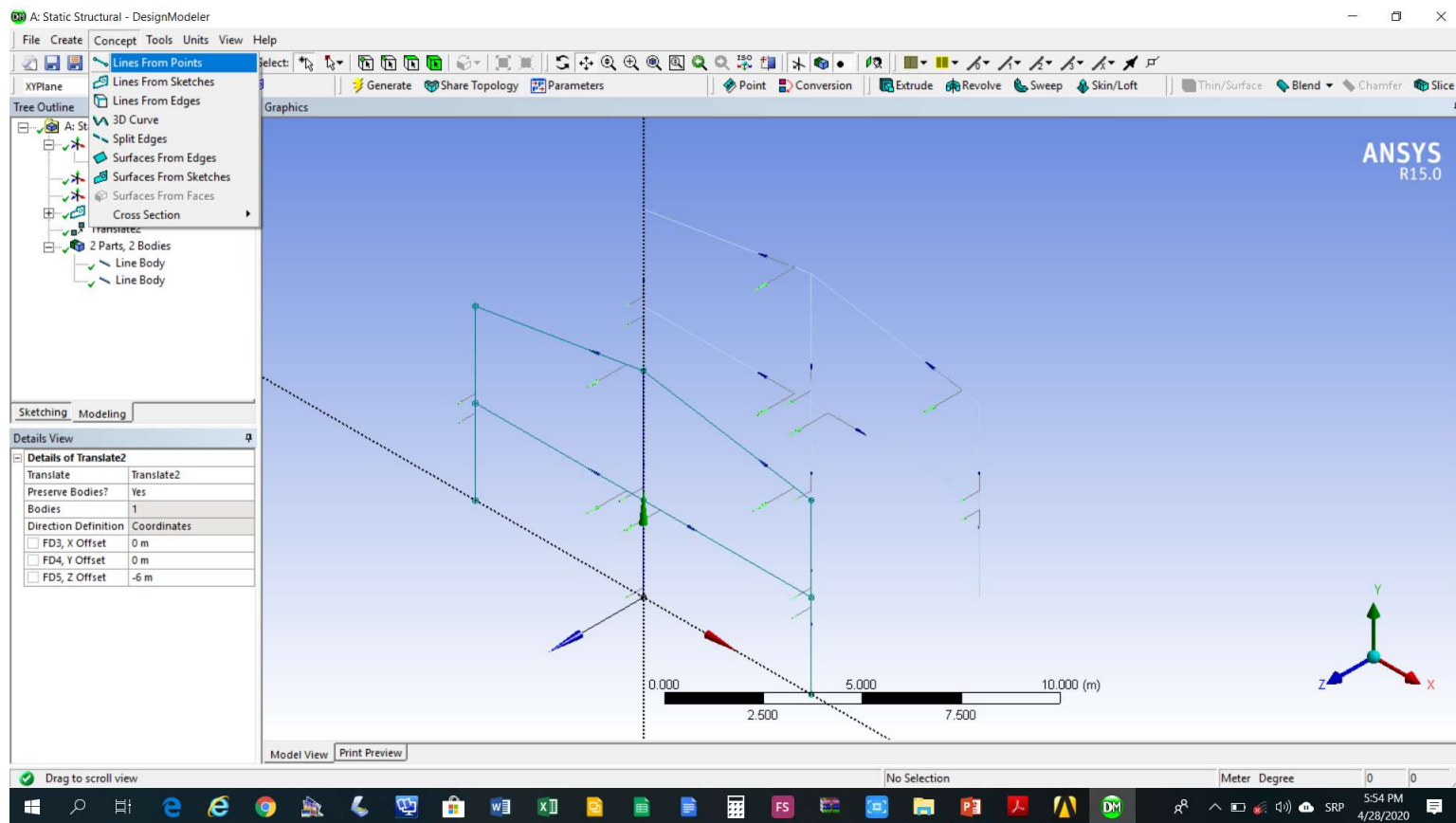
Podesiti parametre Translate1 (Details of Translate1)





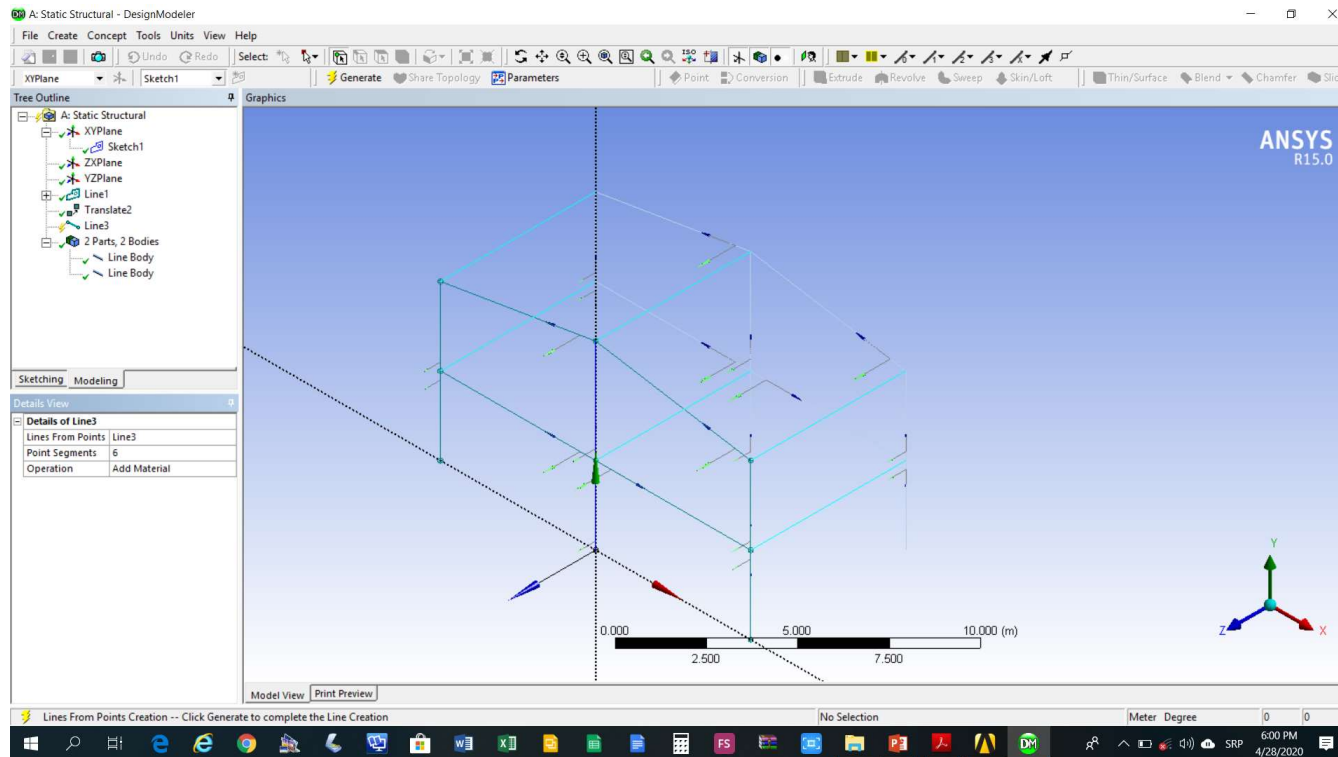
# Modeliranje gredne konstrukcije

Aktivirati opciju (*Concept*->*Lines from Points*)



# Modeliranje gredne konstrukcije

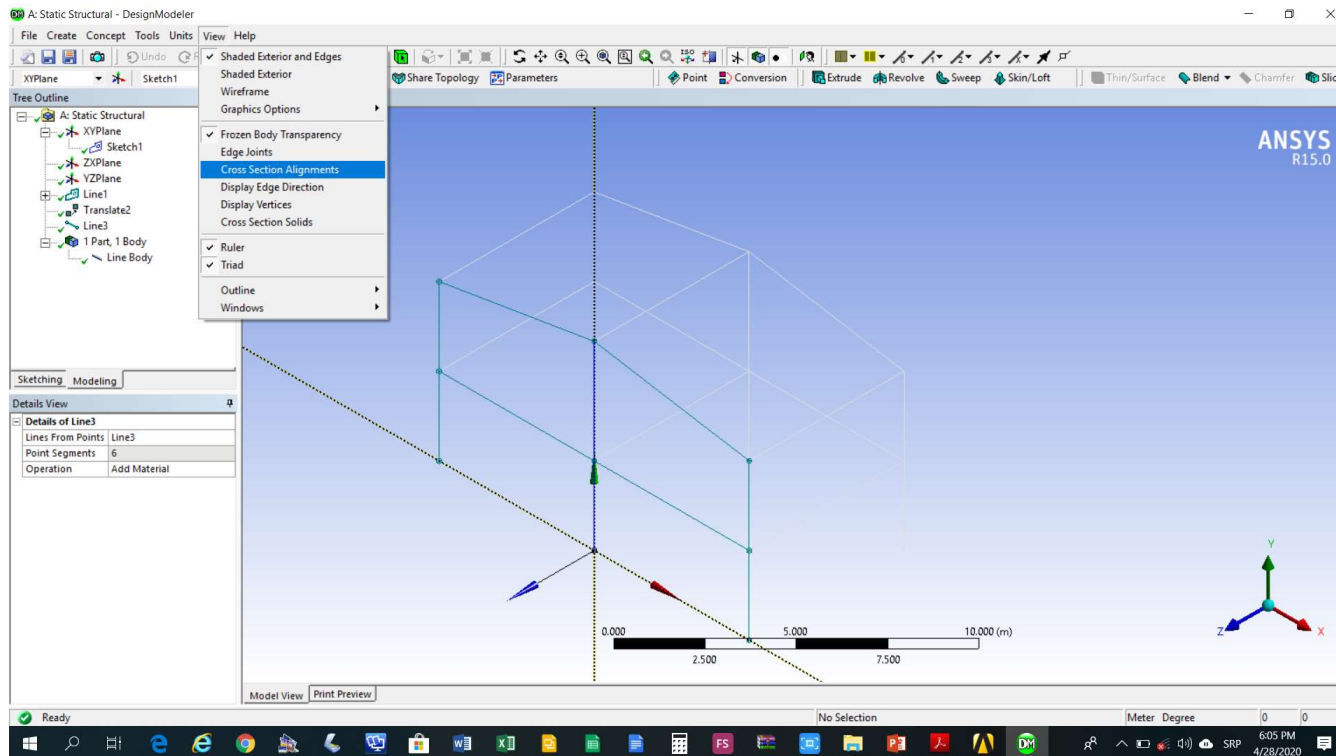
Dodati 6 uzdužnih grede konstrukcije (izabrati početnu tačku grede, a potom i krajnju uz CTRL)





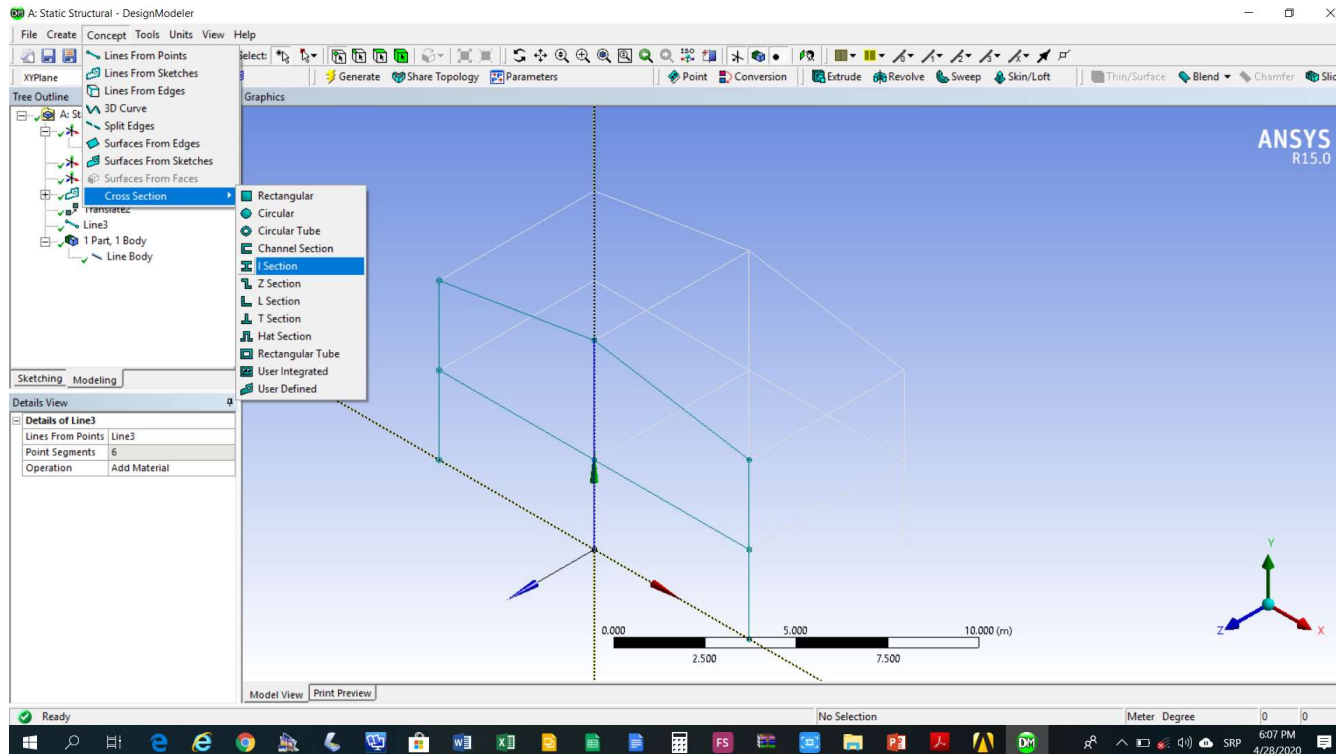
# Modeliranje gredne konstrukcije

Isključiti prikazivanje lokalnih koordinatnih sistema (*View->Cross Sections Alignments*)



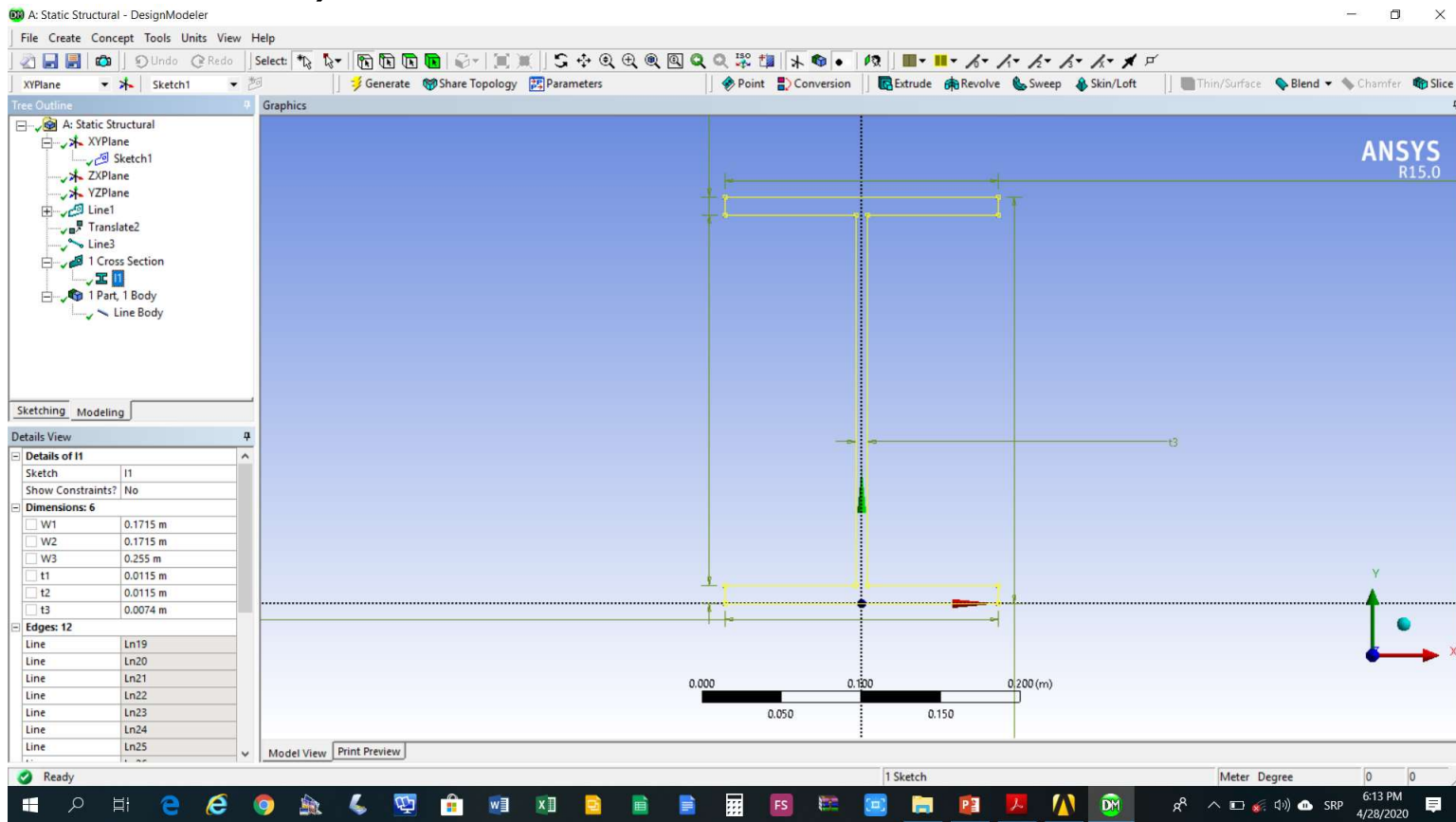
# Modeliranje gredne konstrukcije

Izbor poprečnog presjeka (*Concept*->*Cross Sections*->*I Section*)



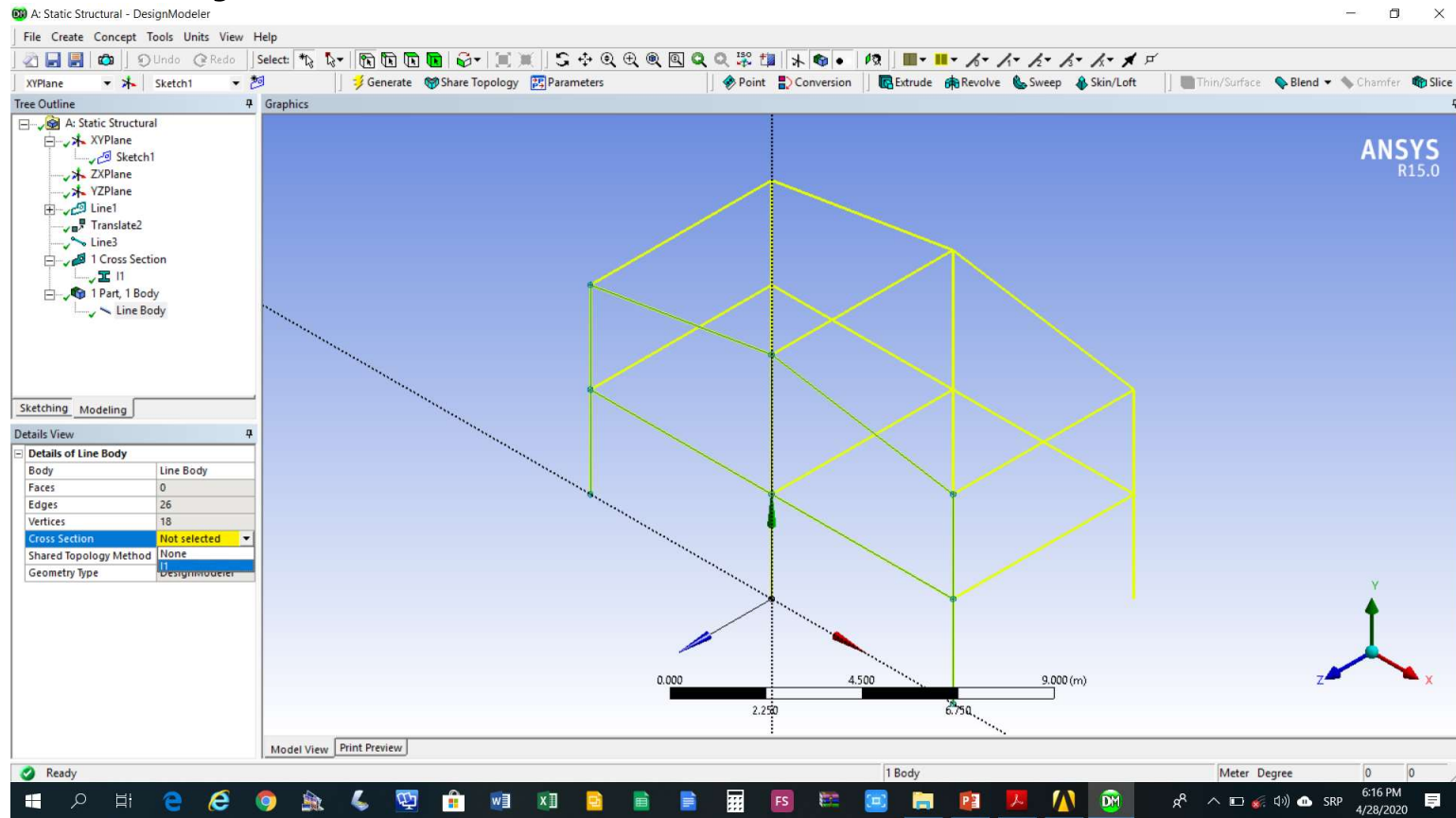
# Modeliranje gredne konstrukcije

## Podešavanje parametara poprečnog presjeka (*Details of I1*)



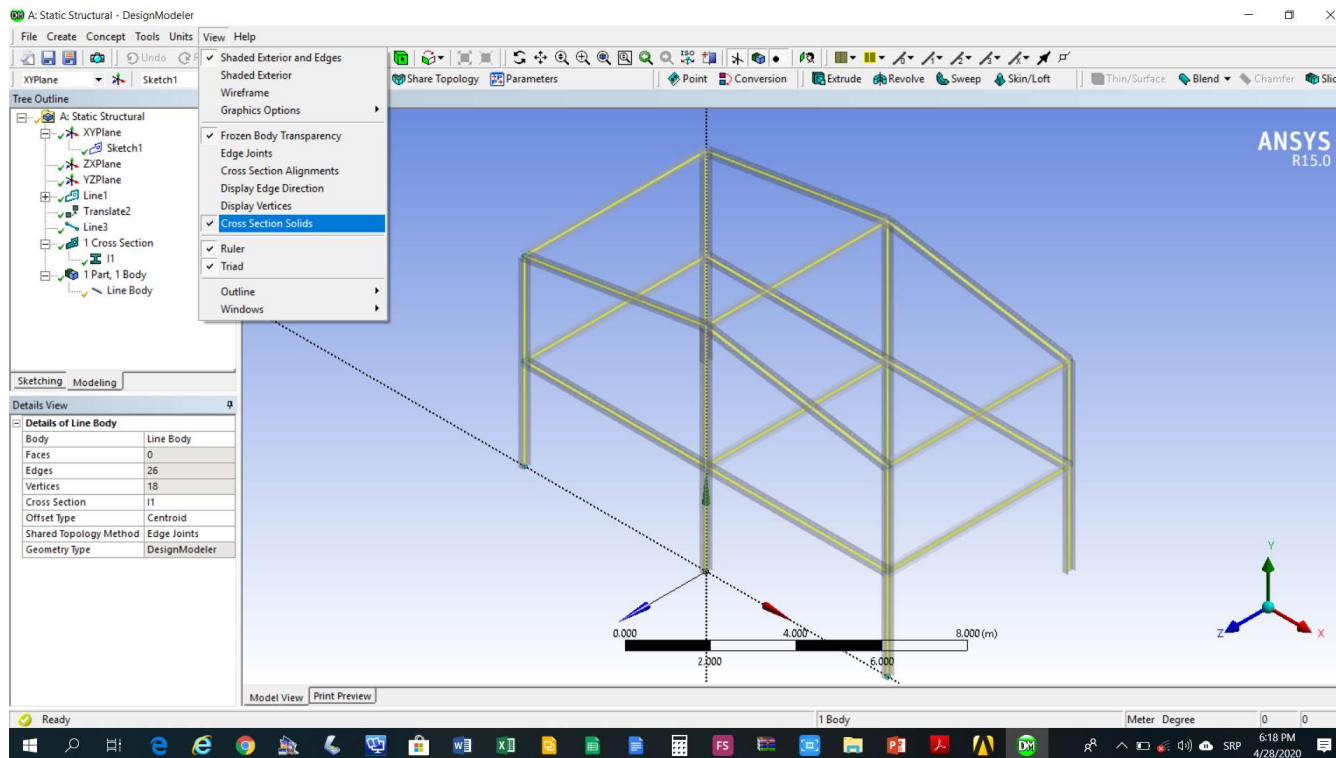
# Modeliranje gredne konstrukcije

Dodjeliti poprečni presjek elementima konstrukcije



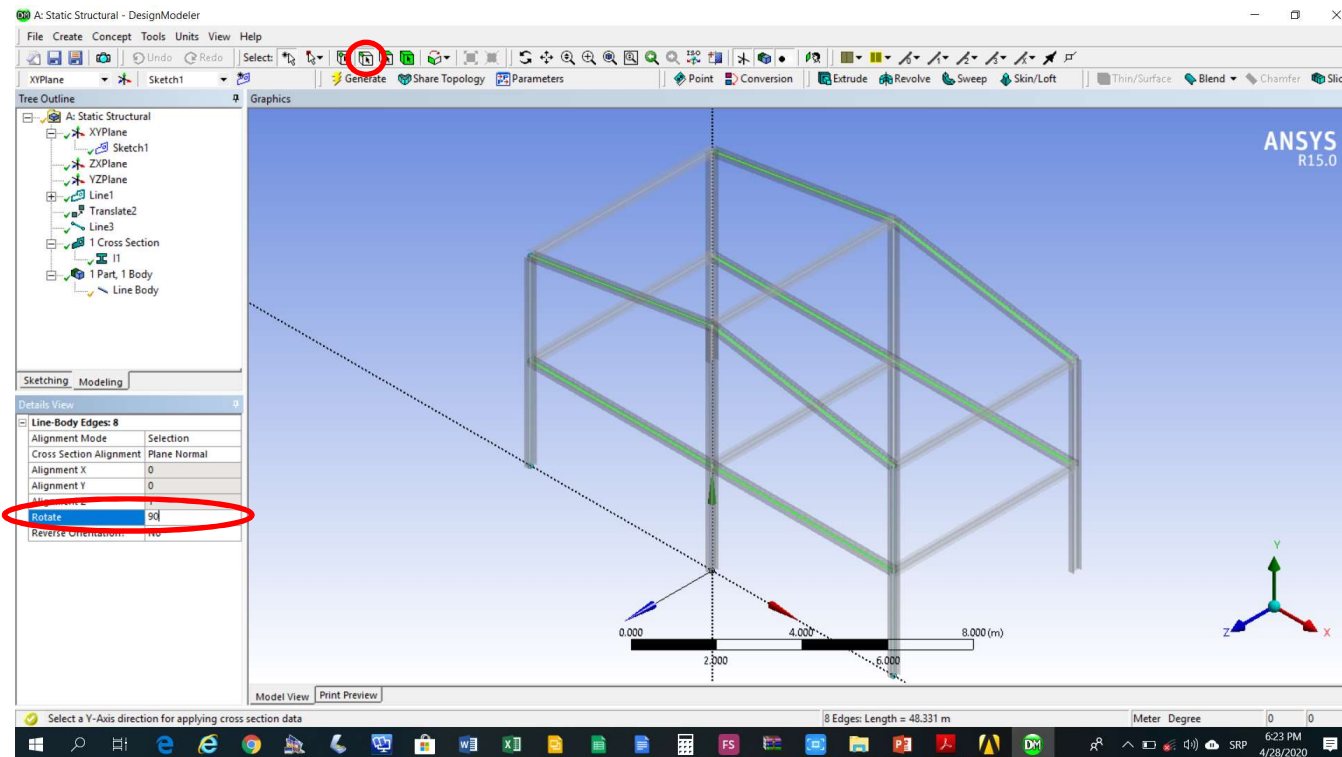
# Modeliranje gredne konstrukcije

Uključiti prikazivanje elemenata konstrukcije kao punih tijela (*View->Cross Sections Solids*)



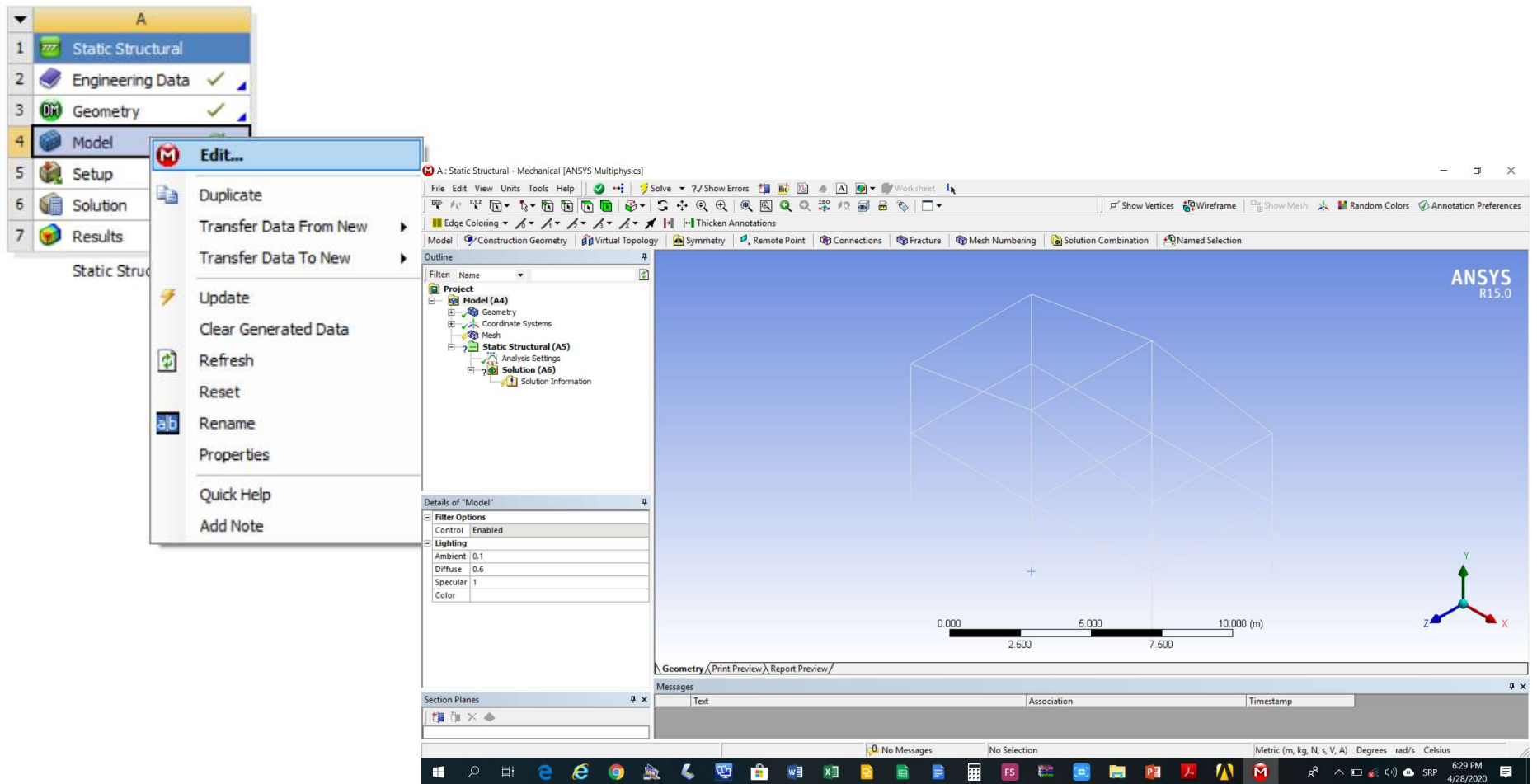
# Modeliranje gredne konstrukcije

8 zelenih elemenata konstrukcije treba zarotirati za  $90^\circ$  kako bi se doveli u potrebni položaj



# Modeliranje gredne konstrukcije

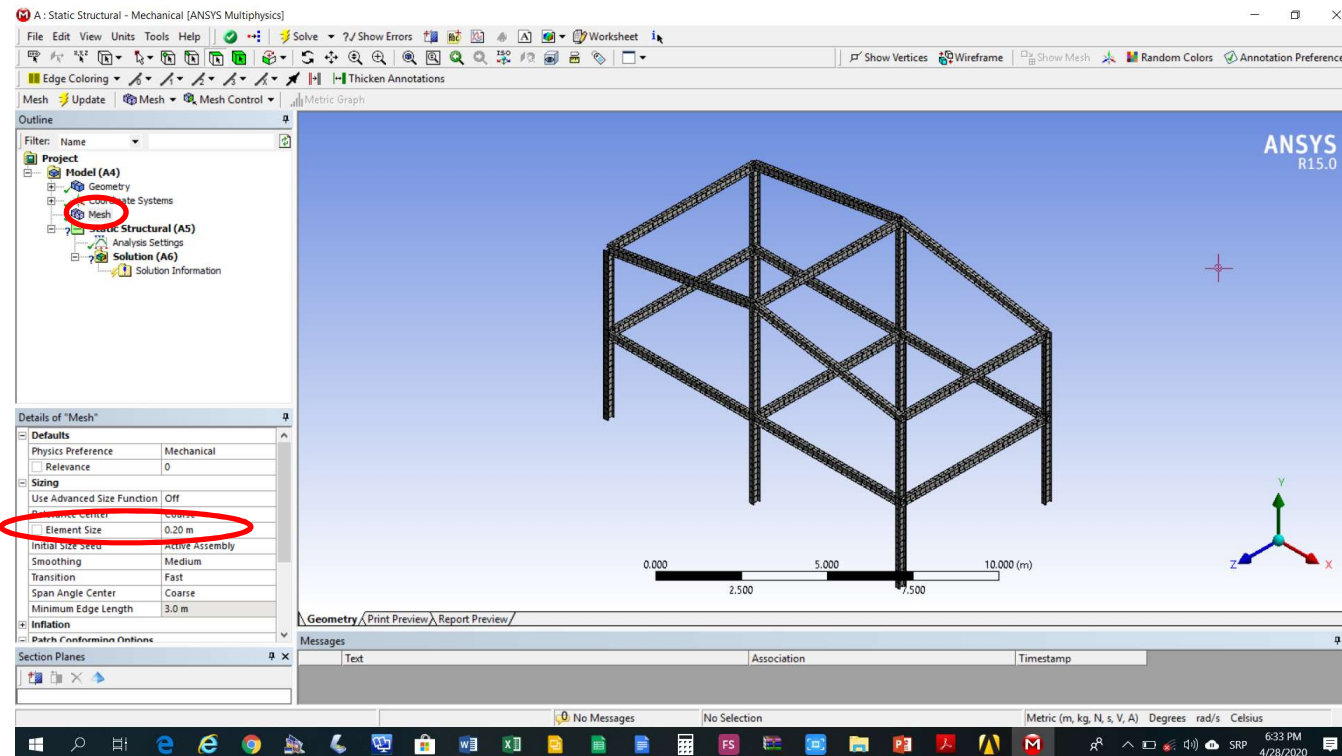
Aktivirati modul Static Structural (*Model*->*Edit*)





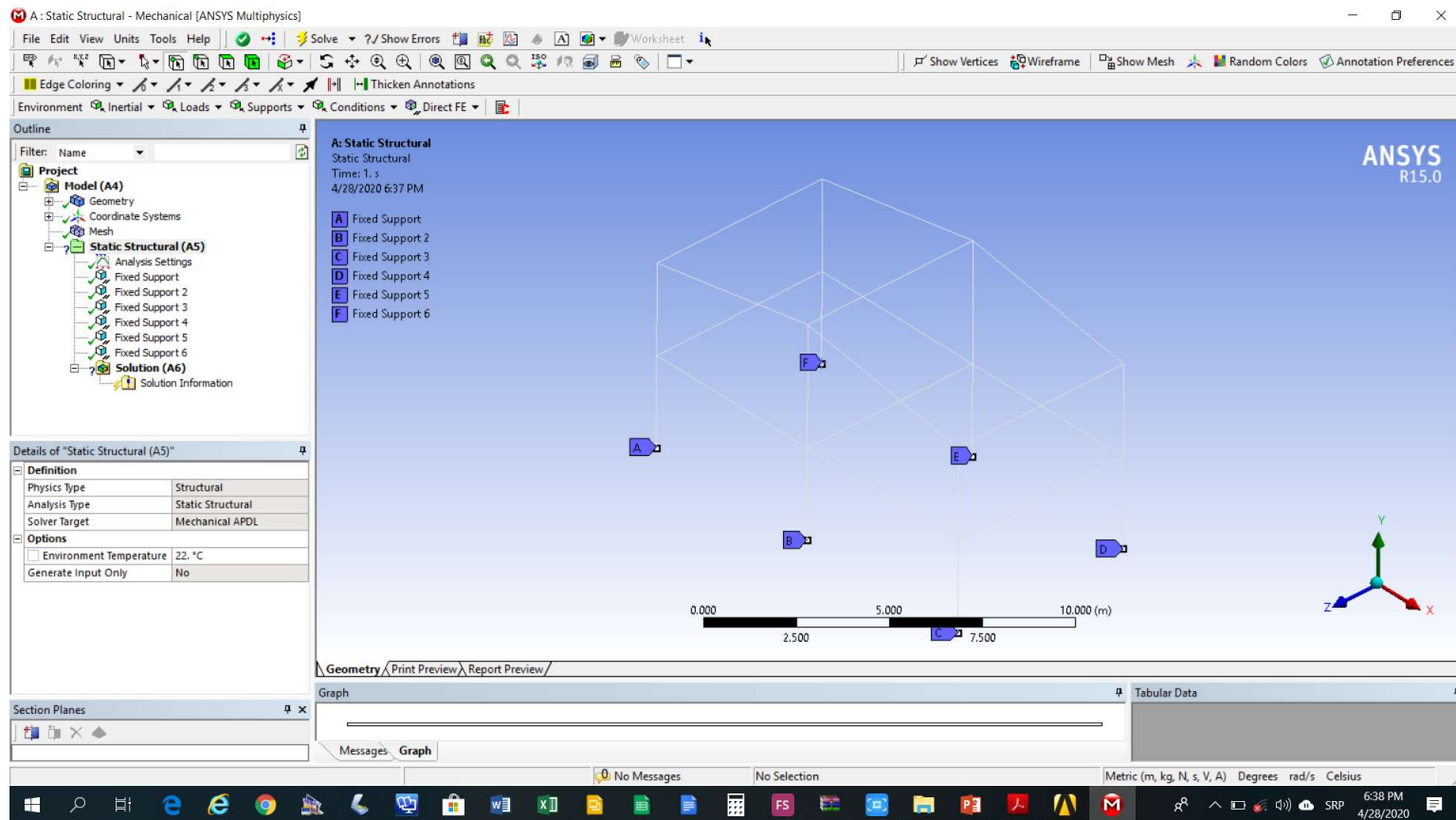
# Modeliranje gredne konstrukcije

Podesiti veličinu konačnog elementa na 0.2 m i generisati mrežu konačnih elemeneta



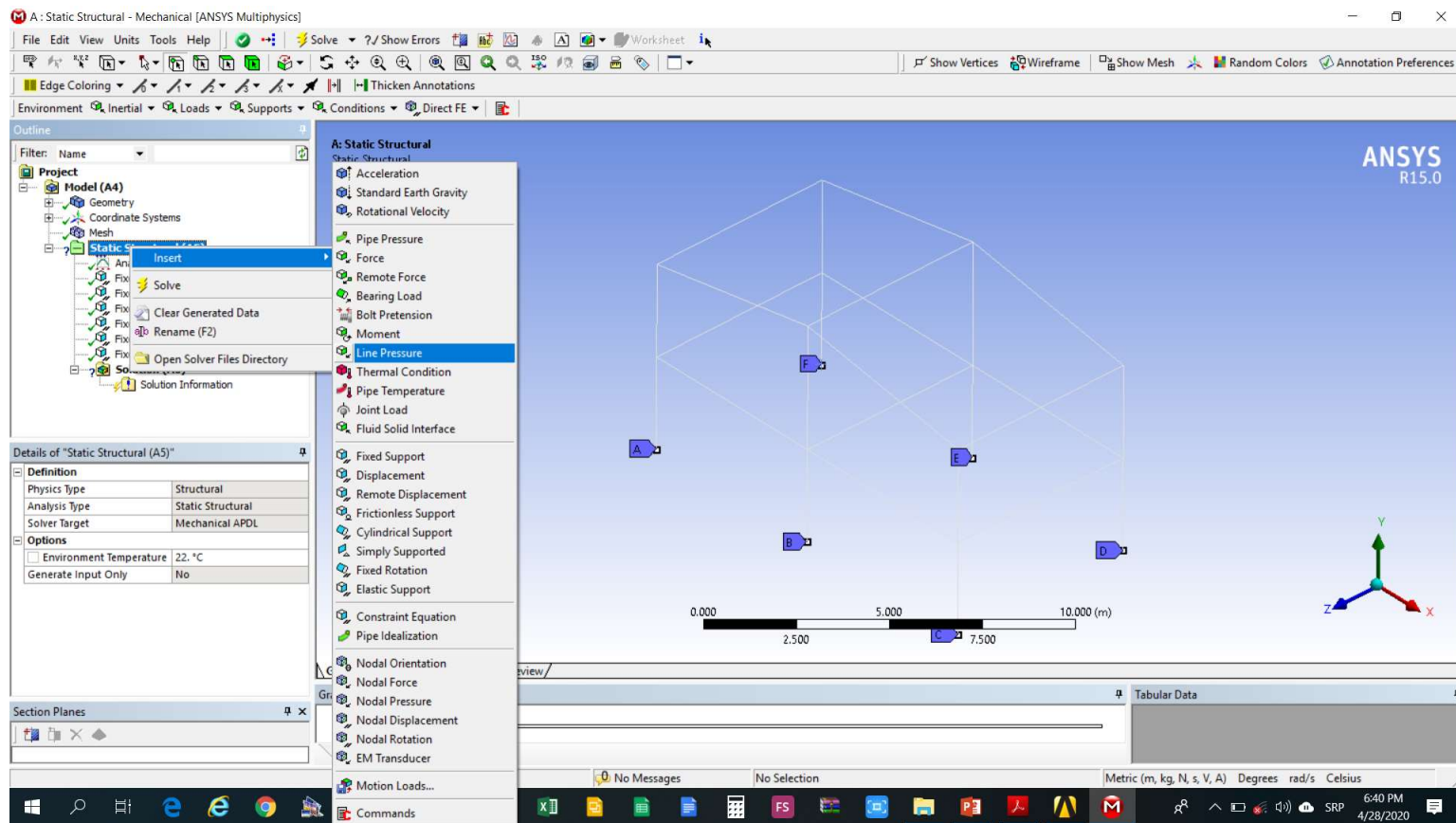
# Modeliranje gredne konstrukcije

## Postaviti nepokretne oslonce



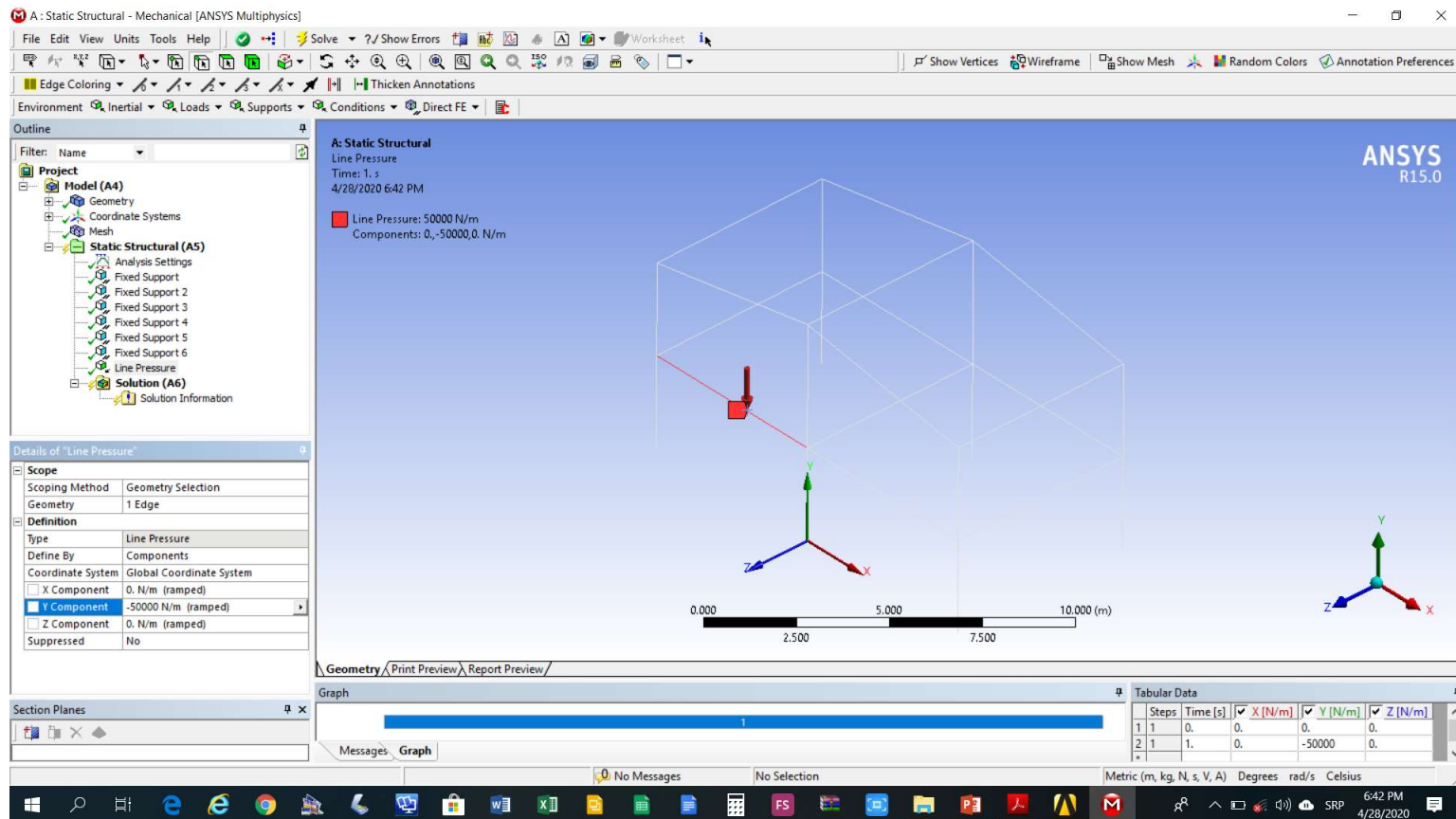
# Modeliranje gredne konstrukcije

## Zadati opterećenje



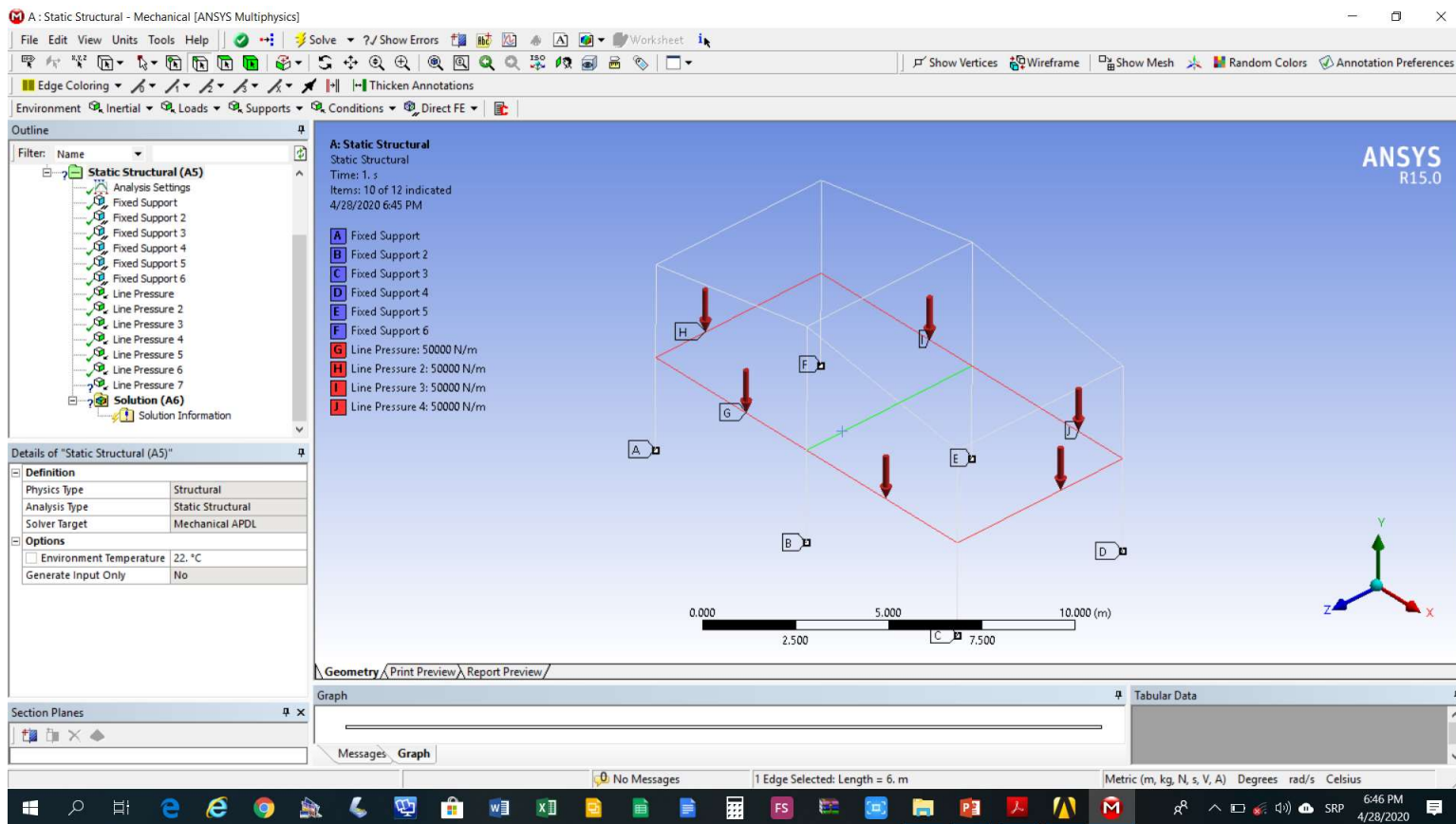
# Modeliranje gredne konstrukcije

Podesiti parametre opterećenje (intezitet i greda)



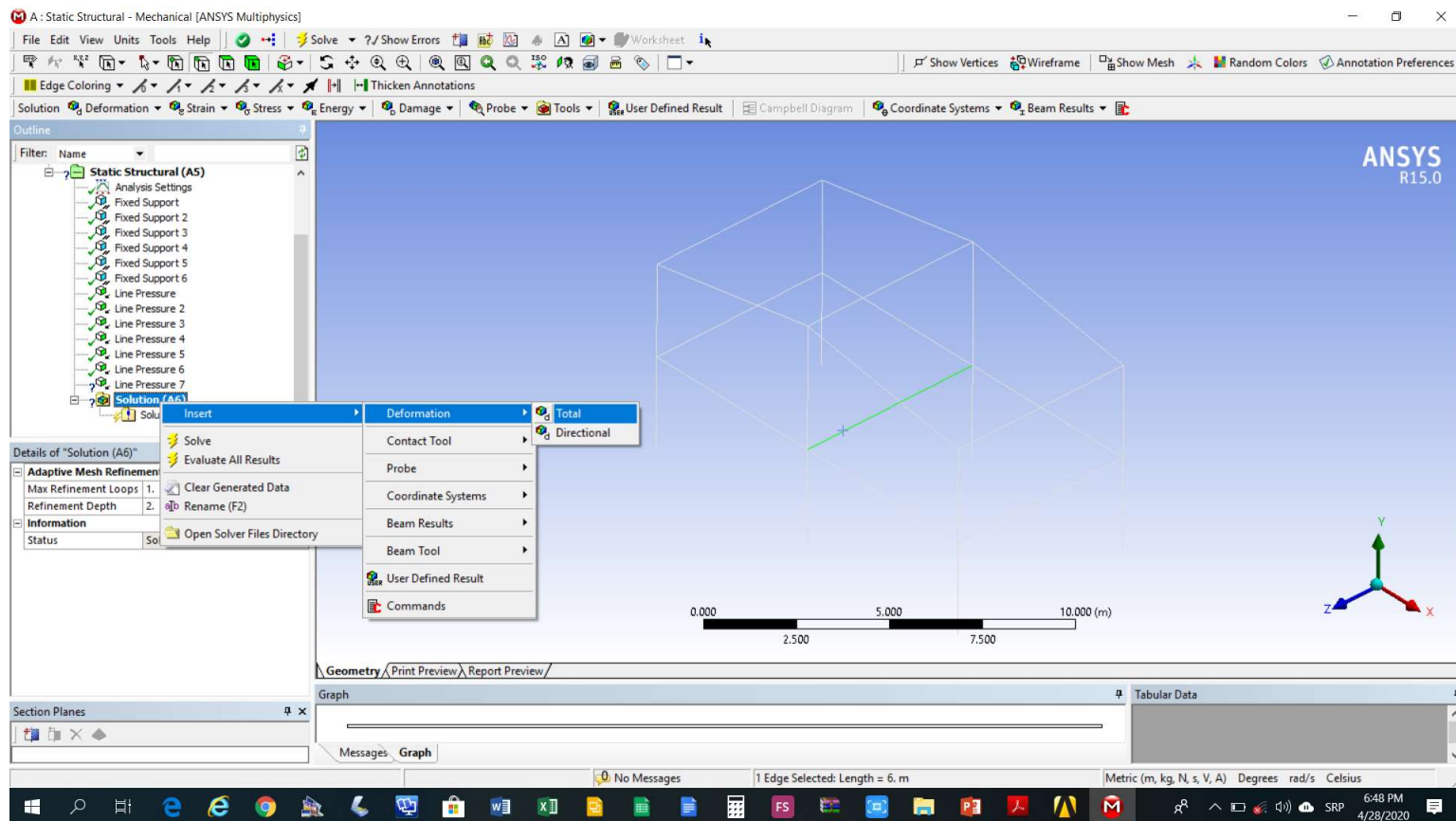
# Modeliranje gredne konstrukcije

## Oslonci i opterećenje gredne konstrukcije



# Modeliranje gredne konstrukcije

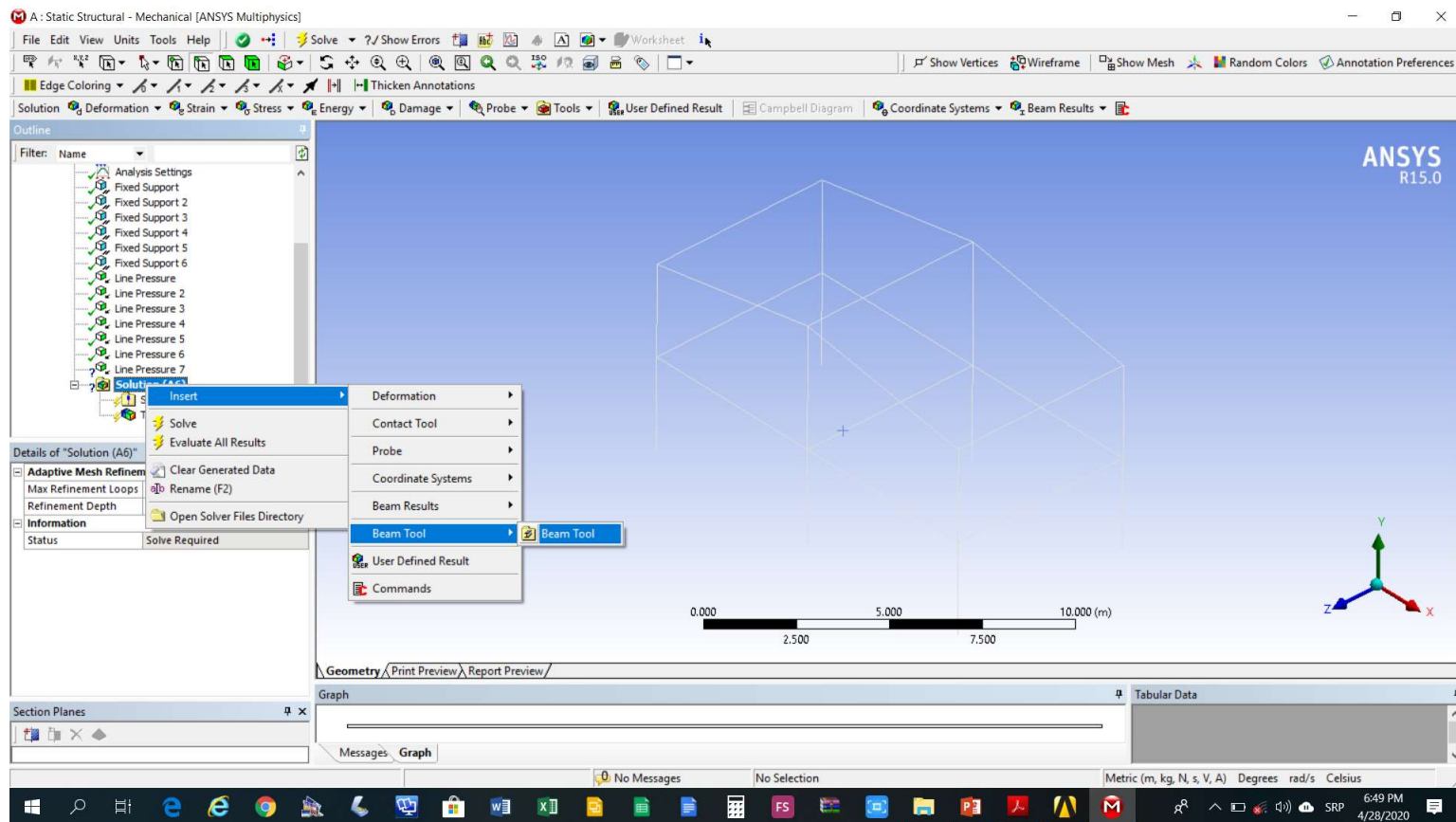
## Izabrati analizu pomjeranja





# Modeliranje gredne konstrukcije

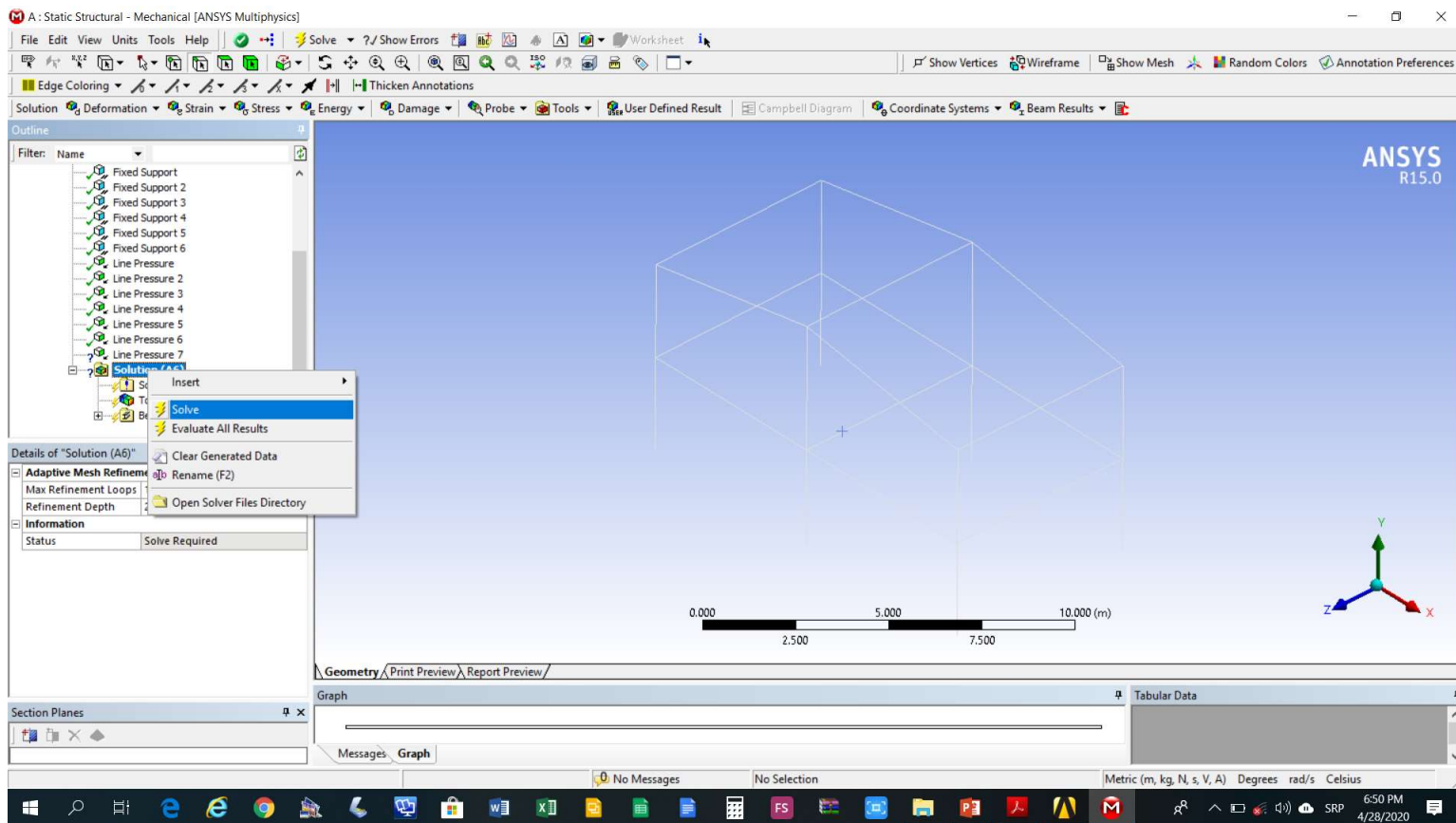
Izabrati alat za analizu grednih konstrukcija





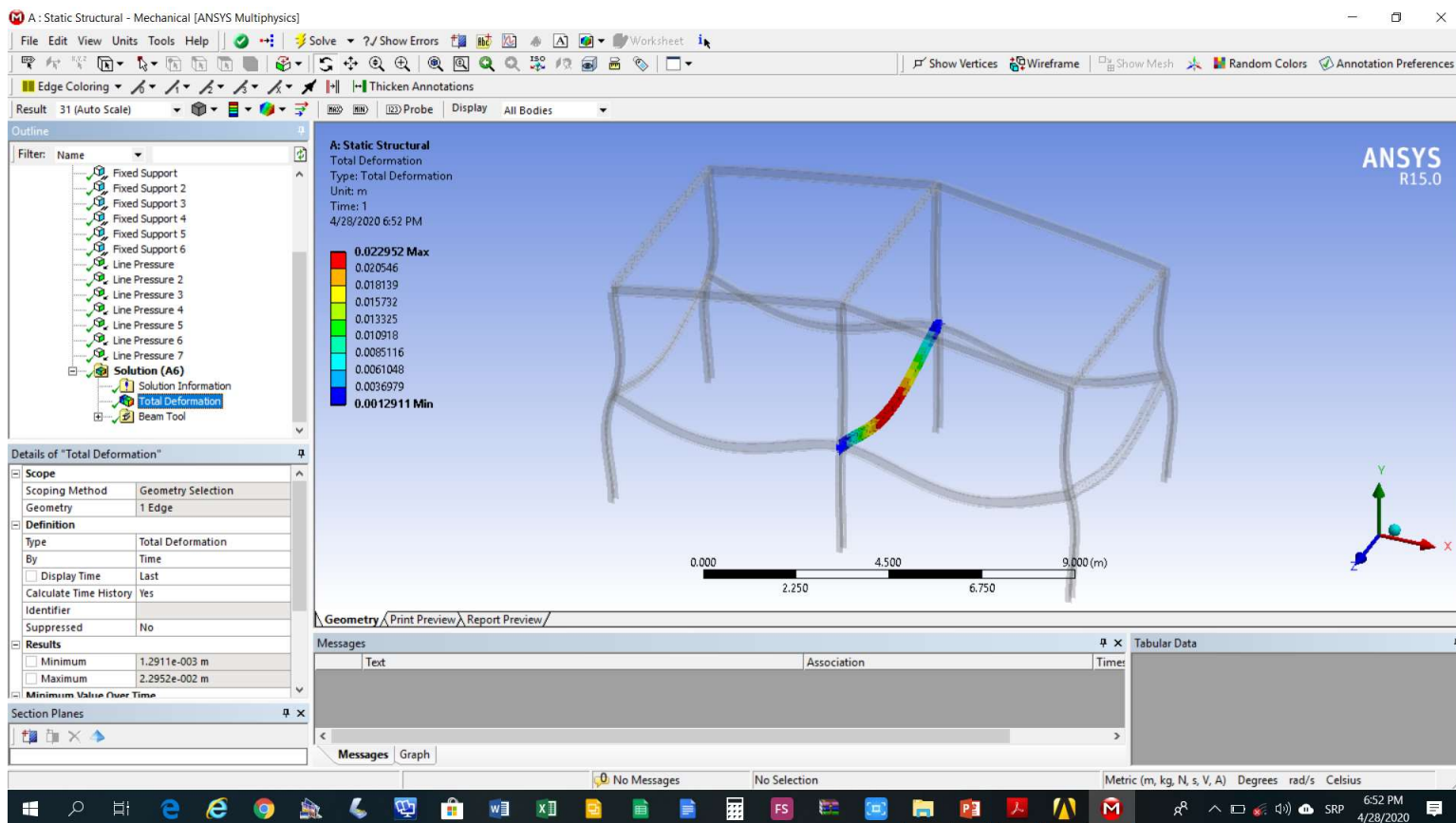
# Modeliranje gredne konstrukcije

## Aktivirati rješavanje problema



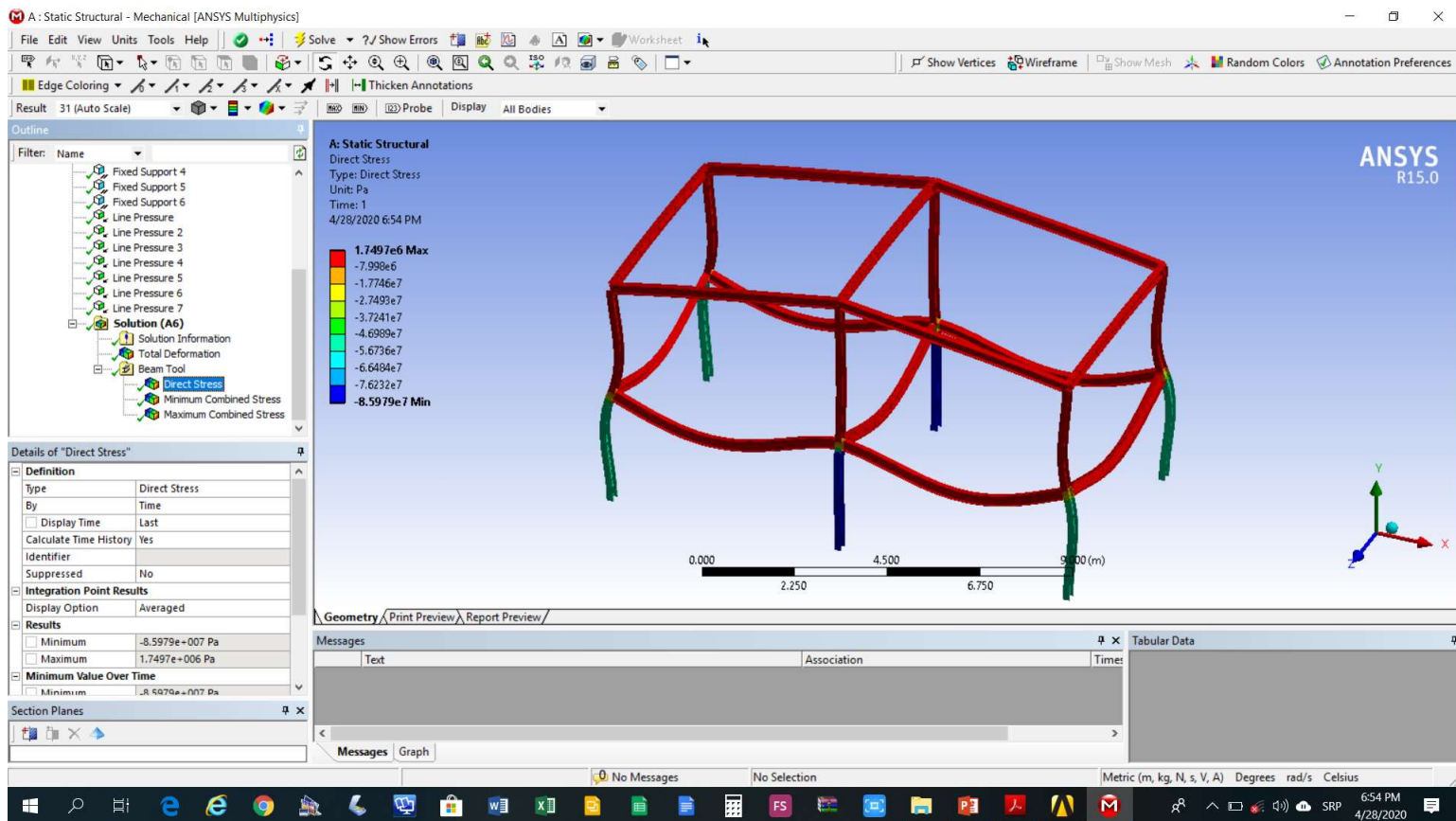
# Modeliranje gredne konstrukcije

## Pomjeranja konstrukcije



# Modeliranje gredne konstrukcije

## Aksijalni naponi konstrukcije (*Beam Tool*->*Direct Stress*)



# Modeliranje gredne konstrukcije

Kombinacija aksijalnog napona i maksimalnog napona savijanja konstrukcije (*Beam Tool- >Maximum Combined Stress*)

