Finite Element Analysis Lab Project

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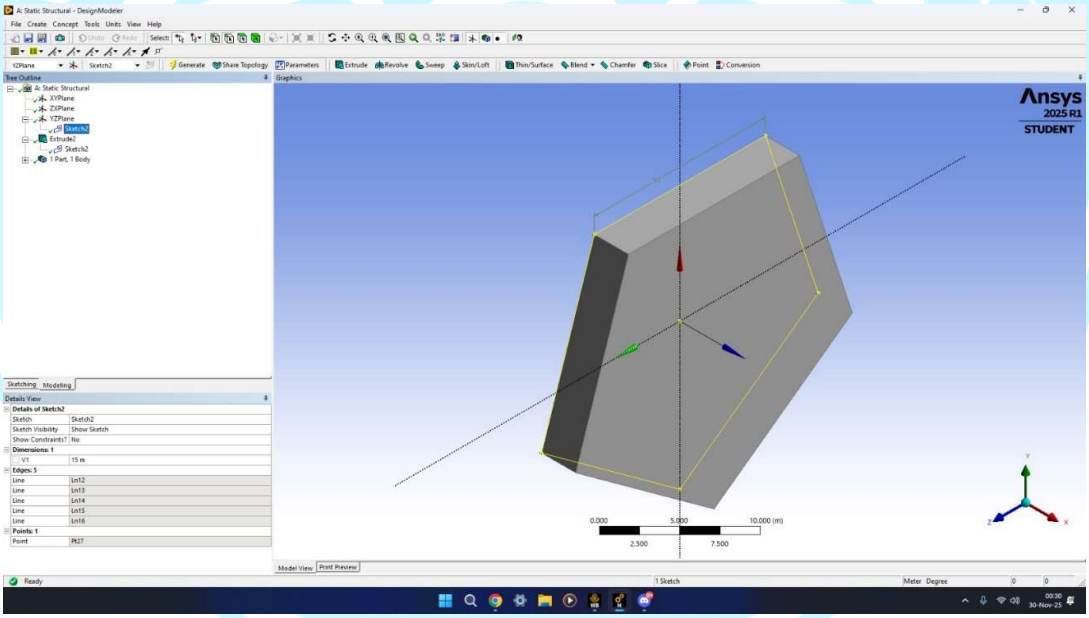
Introduction

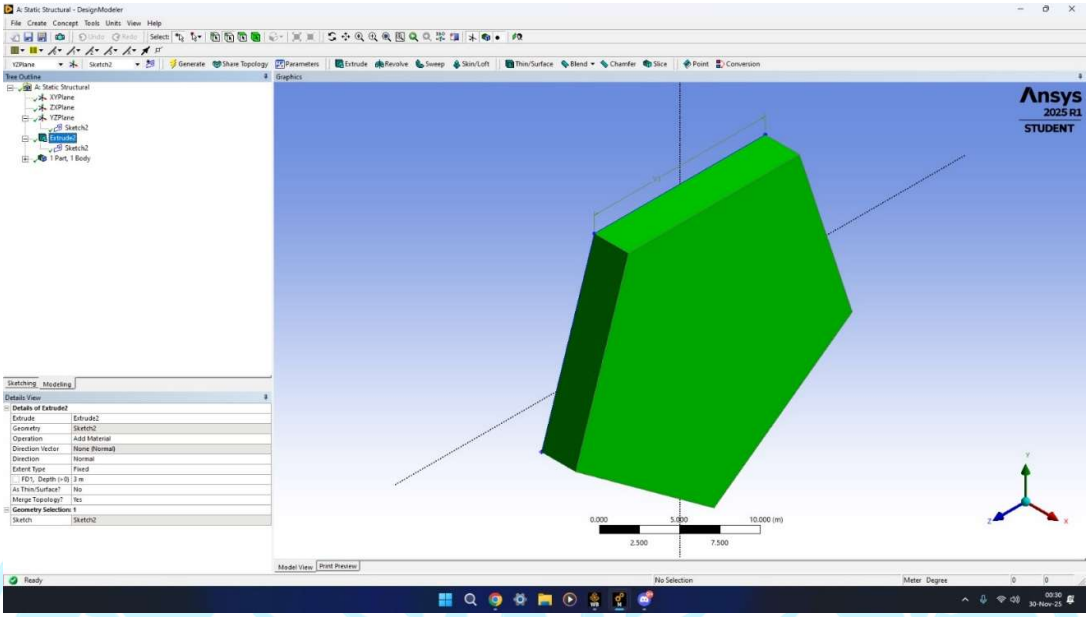
This report presents the static and transient structural analysis of a simple pentagon model using ANSYS. Material properties, boundary conditions, loading, and simulation setup follow the specifications provided:

- **Young's Modulus (E):** 96×10^3 MPa
- **Poisson's Ratio (v):** 0.28
- **Static Load:** Remote force applied at 1/3 of fixed face: 25 + 07 + 2003 = 2035 N
- **Transient Load:** 281.72 N applied on different non-imprinted conic faces
- **Transient Time Step:** 0.2 s
- **Mesh Convergence:** Performed for static simulation

Static Simulation

Geometry

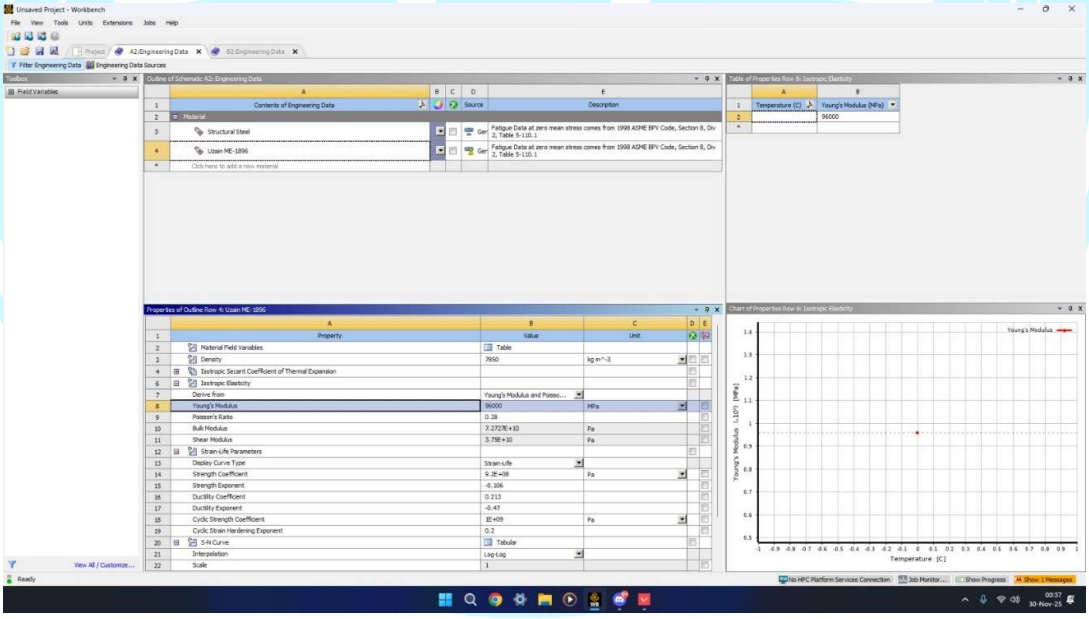




Material Properties

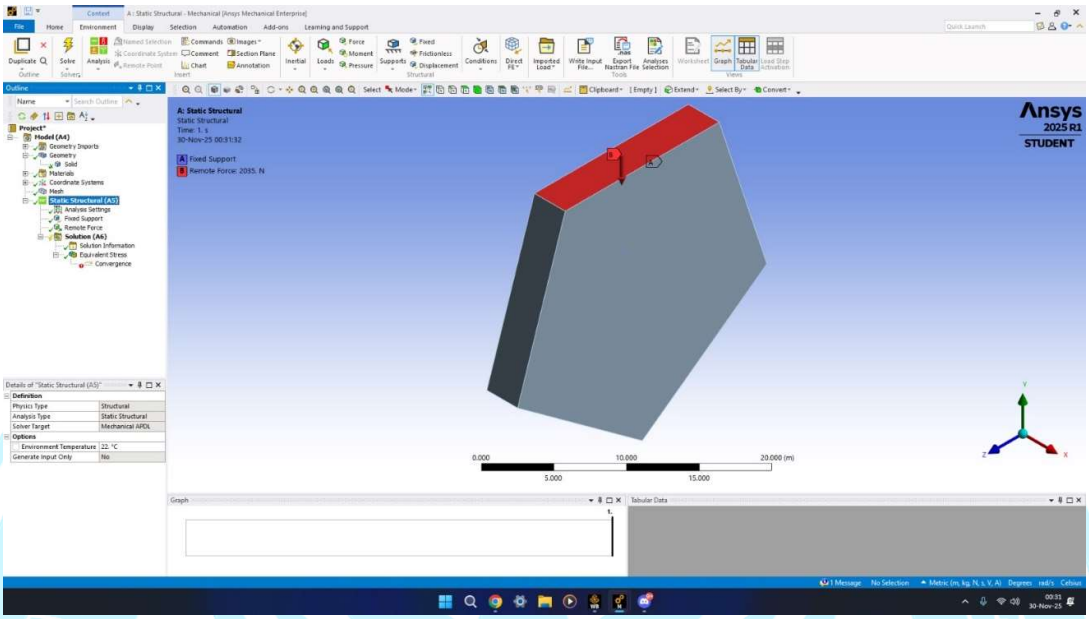
Material assigned according to the problem statement:

- **Young's Modulus:** 96 × 10^3 MPa
- **Poisson's Ratio:** 0.28

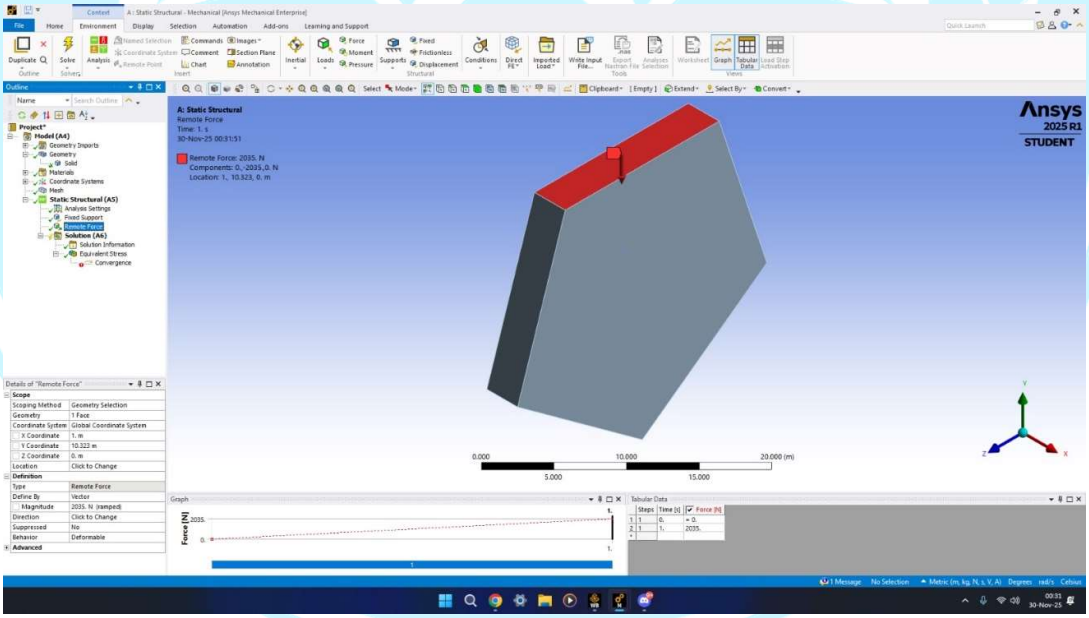


Boundary Conditions

- One pentagon face fully fixed

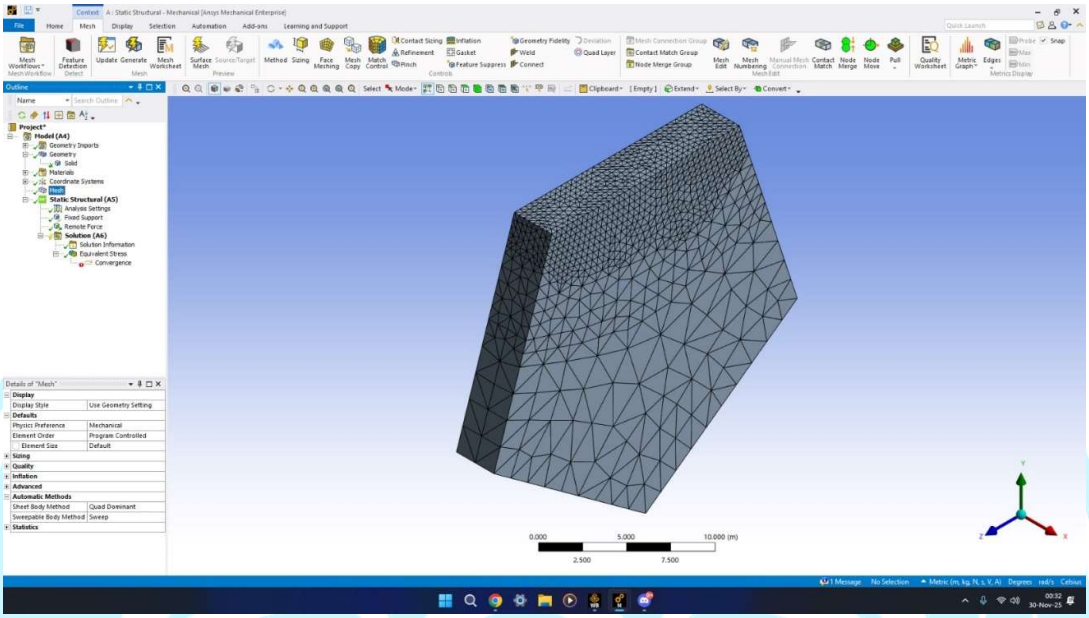


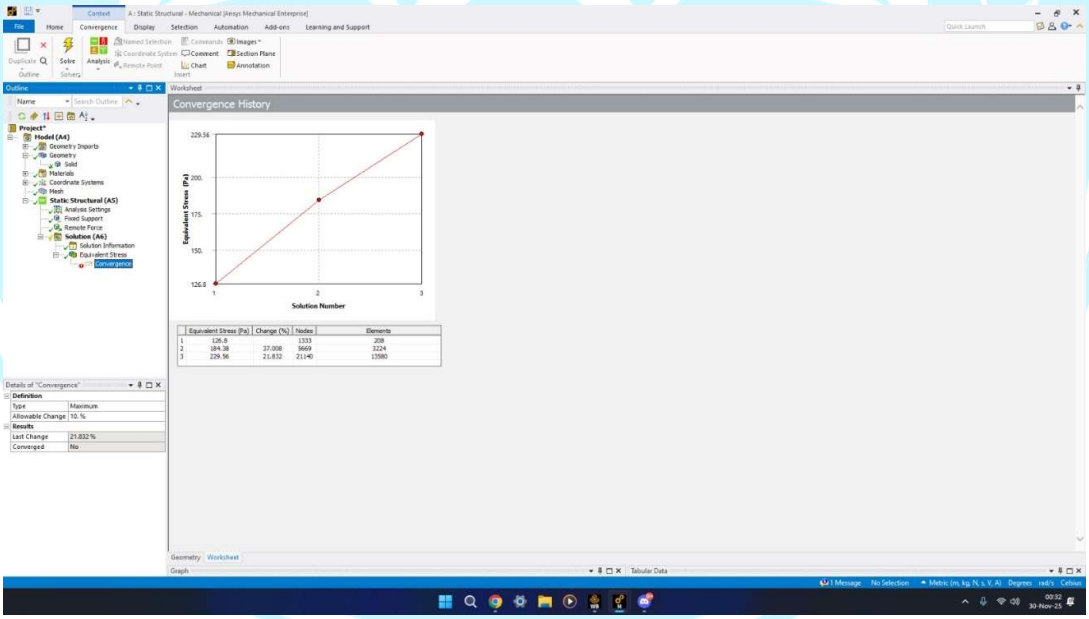
- Remote force applied at 1/3 of the fixed face with magnitude 2035 N



Meshing and Mesh Convergence

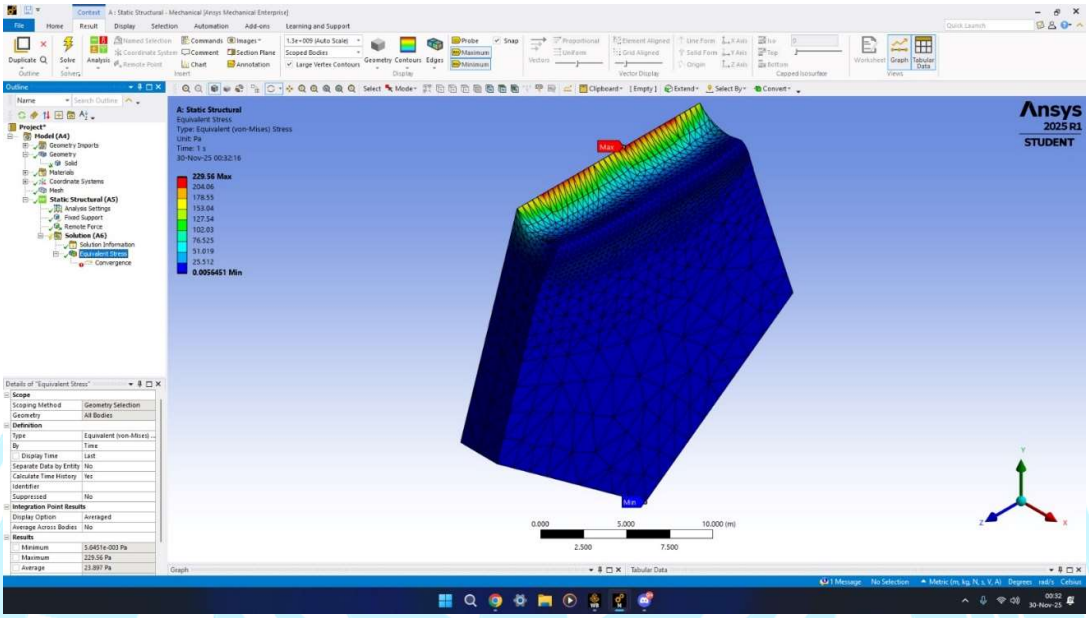
Mesh refinement studies were performed for static analyses. Describe element sizes, types, and convergence criteria.





Results

Equivalent von-Mises stress



Transient Simulation

Geometry

Same Geometry as Static Simulation was used.

Material Properties

Material assigned according to the problem statement:

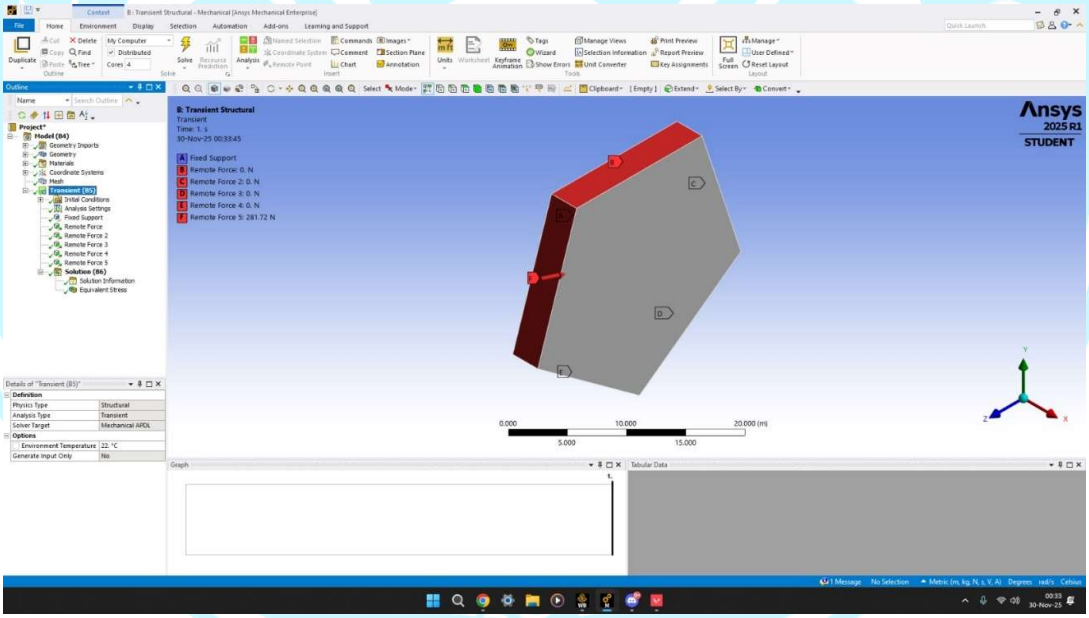
- **Young's Modulus:** 96×10^3 MPa
- **Poisson's Ratio:** 0.28

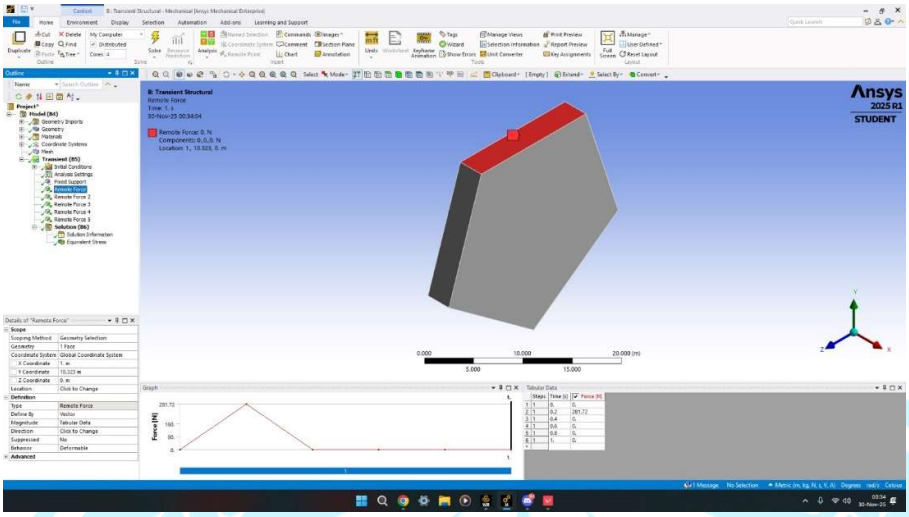
(same as Static Simulation)

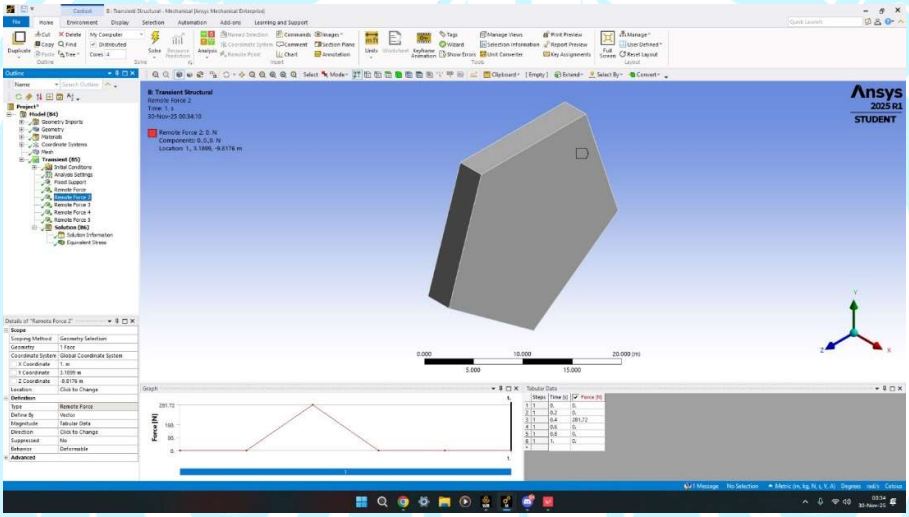
Boundary Conditions

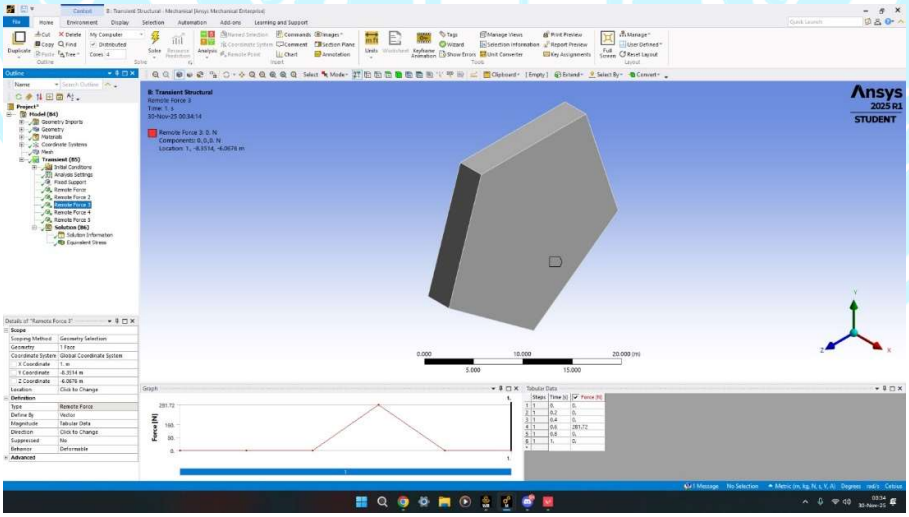
Loads applied to selected conic faces without imprinting

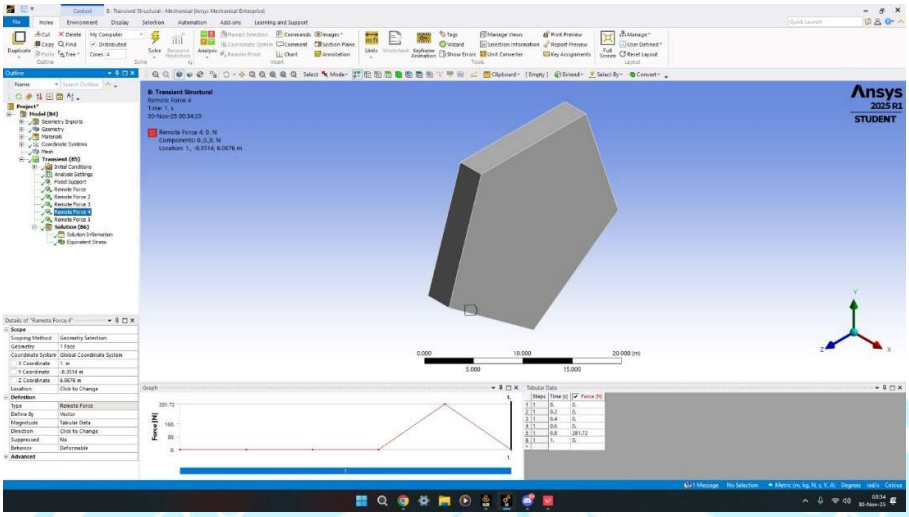
- **Magnitude:** 281.72 N
- **Time Step:** 0.2 s

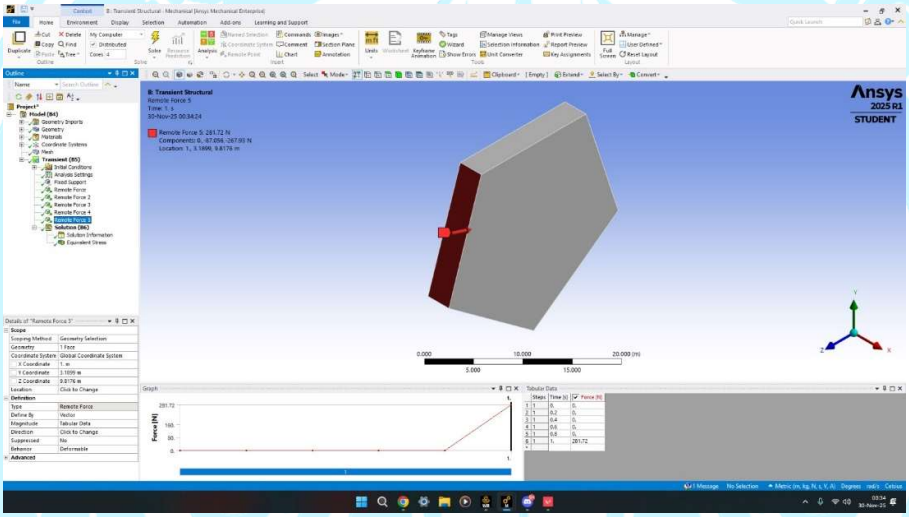



B: Transient Structural
Remote Force
Time: 1. s
30-Nov-25 00:34:04
Remote Force: 0. N
Components: 0.,0.,0. N
Location: 1., 10.323, 0. m
Ansys
2025 R1
STUDENT
0.000
10.000
20.000 (m)
5.000
15.000
Force [N]
281.72
165.
80.
0.
1.

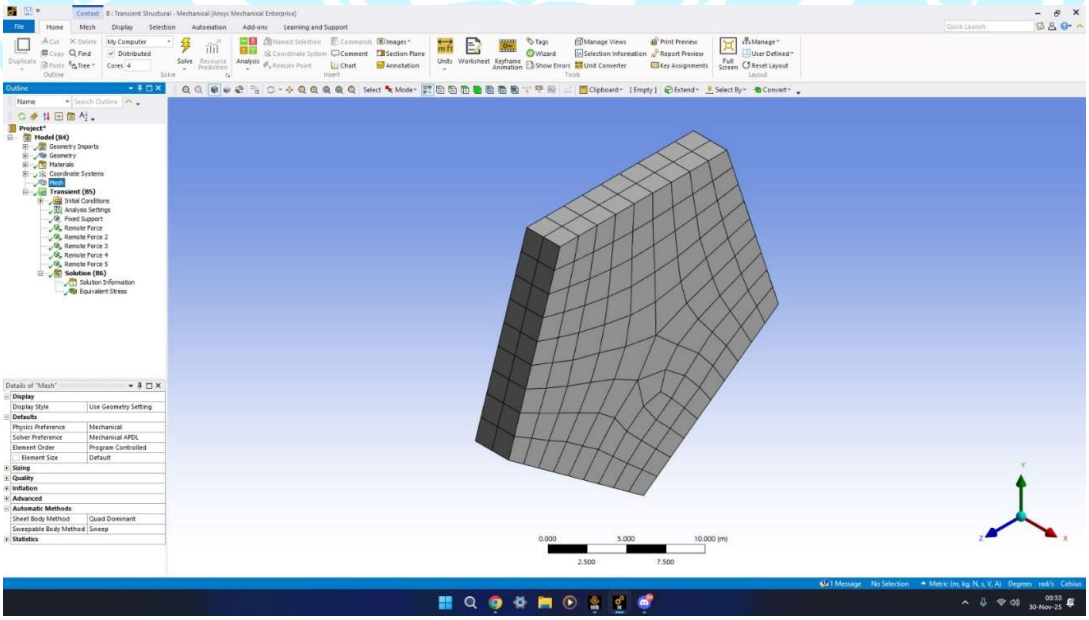

B: Transient Structural
Remote Force 2
Time: 1. s
30-Nov-25 00:34:10
Remote Force 2: 0. N
Components: 0.,0.,0. N
Location: 1., 3.1899, -9.8176 m
Ansys
2025 R1
STUDENT
0.000
10.000
20.000 (m)
5.000
15.000
Force [N]
281.72
165.
80.
0.
1.


B: Transient Structural
Remote Force 3
Time: 1. s
30-Nov-25 00:34:14
Remote Force 2: 0. N
Components: 0.,0.,0. N
Location: 1., -6.3514, -6.0676 m
Ansys
2025 R1
STUDENT
0.000
10.000
20.000 (m)
5.000
15.000
Force [N]
281.72
165.
80.
0.
1.





Meshing



Results

Include:

Time-dependent deformation

Stress variation over time

Response graphs (if applicable)