National University Of Sciences and Technology

Report Ansys Lab

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ME-1915

Section A

CMS 426042

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Static Structural

- A new material named **"Zohaib Hexagon"** was added to the Engineering Data section.

  Specific **Isotropic Elasticity** properties were defined for this custom material[9]:

- **Young's Modulus:** 15000 MPa
- **Poisson's Ratio:** 0.28

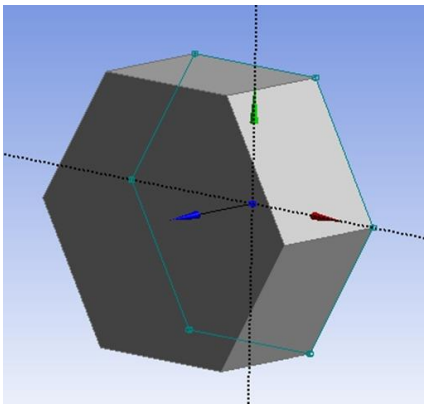
Outline of Schematic A2: Engineering Data

	A	B	C	D	E
1	Contents of Engineering Data			Source	Description
2	Material				
3	Structural Steel				Fatigue Data at zero mean stress comes from 1998 ASME BPV Code, Section 8, Div 2, Table 5 -110.1
4	Zohaib Hexagon				
*	Click here to add a new material				

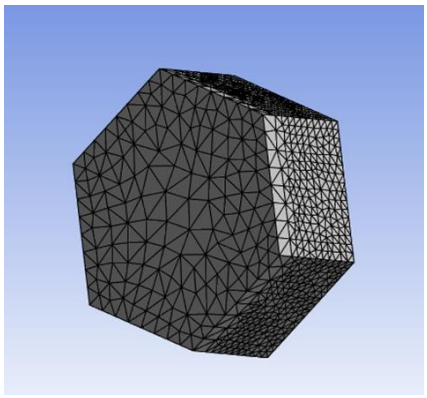
Properties of Outline Row 4: Zohaib Hexagon

	A	B	C	D	E
1	Property	Value	Unit		
2	Material Field Variables	Table			
3	Isotropic Elasticity				
4	Derive from	Young's Modulu...			
5	Young's Modulus	15000	MPa		
6	Poisson's Ratio	0.28			
7	Bulk Modulus	1.1364E+10	Pa		
8	Shear Modulus	5.8594E+09	Pa		

- A **Hexagon** shape was selected for the geometry, apparently based on the roll number. The 2D hexagonal cross-section was then **extruded by 3 meters** to create a 3D hexagonal prism

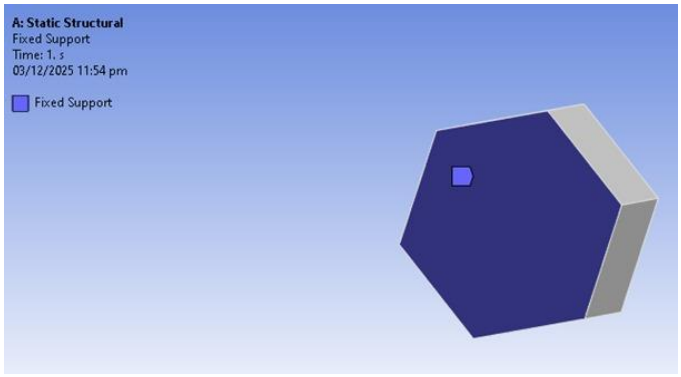


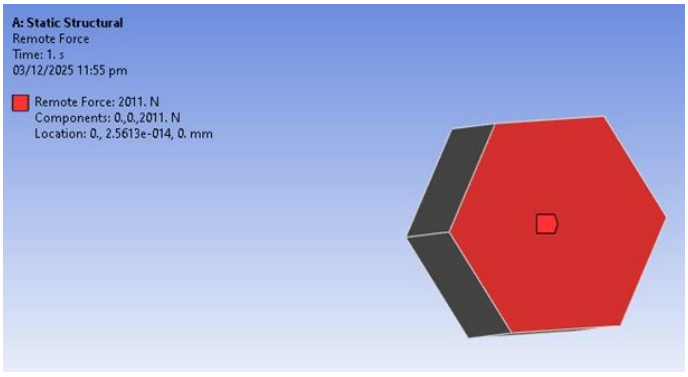
- An **automatic mesh** was applied to the 3D structure in the Model section. Meshing involves dividing the continuous geometric model into smaller, discrete elements (here, triangular elements) for the Finite Element Method (FEM) analysis.



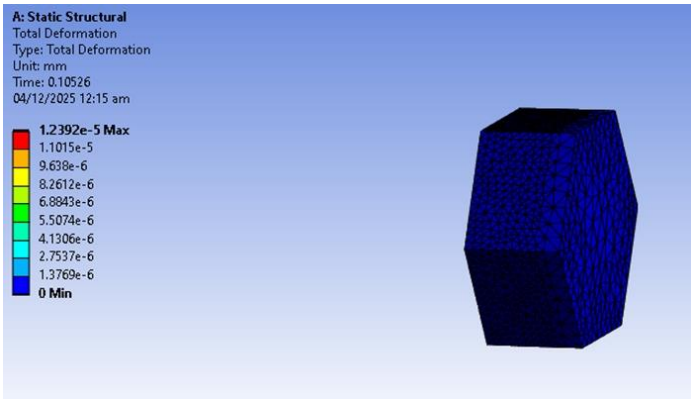
➢ Boundary Conditions and Loading

- **Fixed Support:** One face of the hexagonal geometry was constrained with a **Fixed Support**, preventing any translation or rotation on that surface. This simulates the component being rigidly attached or anchored.
- **Remote Force Application:** A **Remote Force** of **2011 N** was applied to the other, opposite face. The magnitude of the force (2011 N) was determined by adding the digits of the Date of Birth. A remote force is a concentrated load applied at a point that influences the surface as if it were applied remotely.

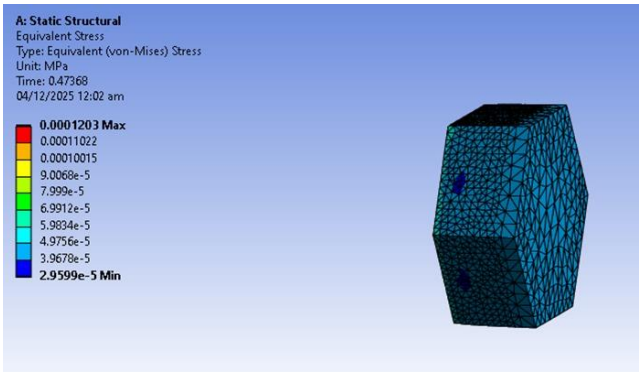




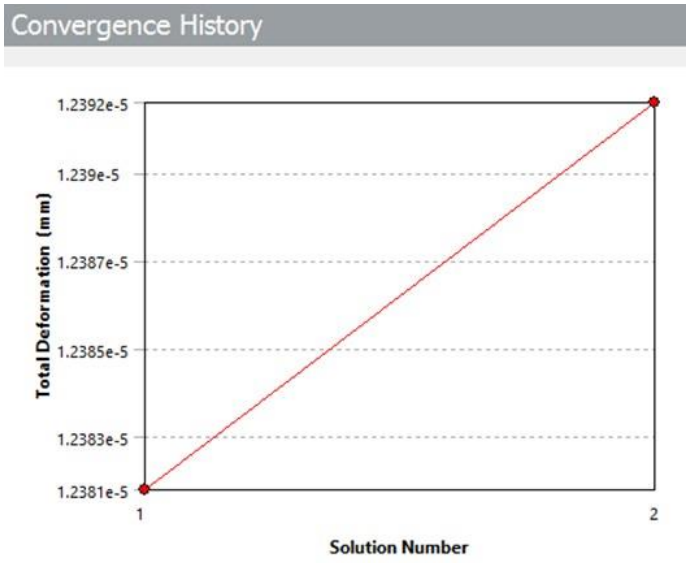
➢ The total displacement field was calculated and visualized.



➢ **Equivalent (von-Mises) Stress:** The equivalent stress was calculated and visualized, with a maximum value of 0.0001203 MPa. The von-Mises stress is a single value used to predict the yielding of materials under complex loading.

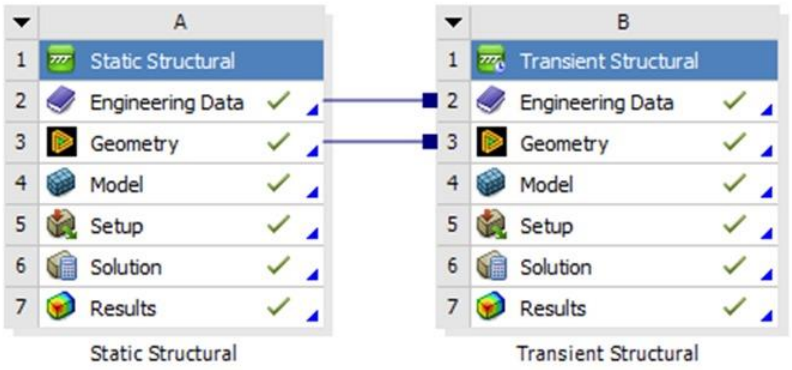


- **Mesh Convergence:** A **Convergence History Graph** was generated. This plot of Total Deformation (mm) versus Solution Number (e.g., mesh size refinement) demonstrates that the solution is approaching a stable value as the mesh is refined, indicating the results are reliable.

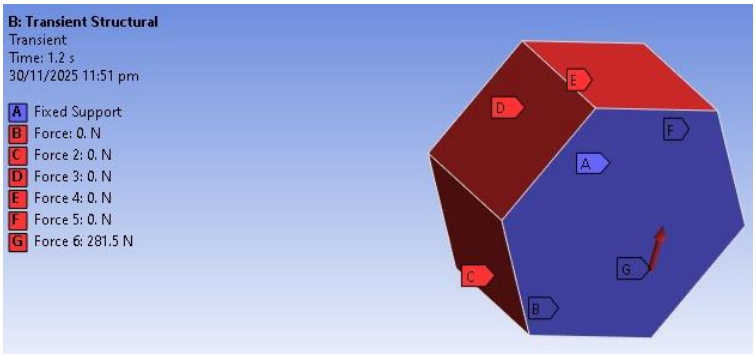


Transient Structural

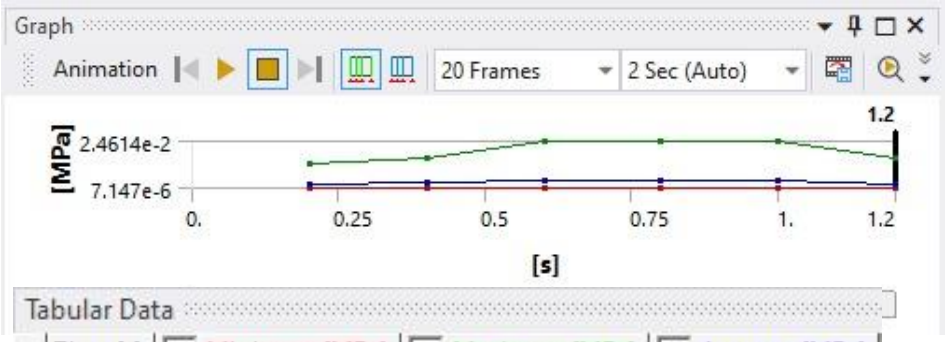
- The **Engineering Data** (material properties) and **Geometry** (the hexagonal shape) from the previous Static Structural analysis were connected and used for the time-dependent study.



- A force of **281.5 N** (representing a dollar rate) was applied. This force was applied across **six faces** of the hexagon. The simulation ran with a time interval of **0.2 seconds** for a total time of 1.2 seconds.



- Generated graph after solving applied force in tabular form.

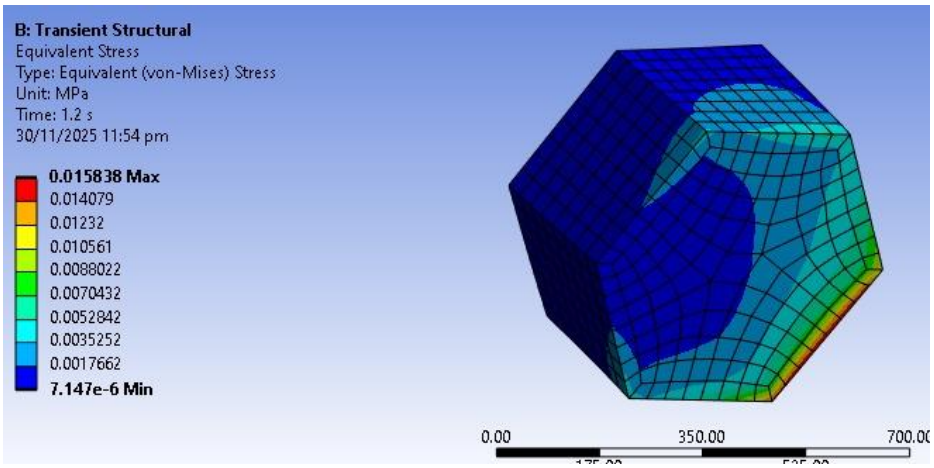


- A graph showing the time-varying results and a **Tabular Data** table of minimum, maximum, and average stress values were generated.

Tabular Data

	Time [s]	Minimum [MPa]	Maximum [MPa]	Average [MPa]
1	0.2	2.5168e-005	1.2571e-002	1.7745e-003
2	0.4	9.7653e-006	1.5874e-002	2.6121e-003
3	0.6	9.4489e-006	2.4402e-002	3.5273e-003
4	0.8	9.5191e-006	2.4281e-002	3.5037e-003
5	1.	1.0583e-005	2.4614e-002	4.1501e-003
6	1.2	7.147e-006	1.5838e-002	2.224e-003

- The maximum Equivalent (von-Mises) Stress at the final time (t=1.2s) was **0.015838 MPa**.



- The maximum Total Deformation