Project 7: ABAQUS Viscoelastic Modeling: Creep Test on Epoxy Material

Problem Statement: Model the deformation of epoxy material (viscoelastic material properties).

Geometry:

Material Properties:

Mass Density
1.18E-09

Moduli time scale (for viscoelasticity): Instantaneous

☐ No compression

☐ No tension

Data

	Young's Modulus	Poisson's Ratio
1	4060.1	0.37

Viscoelastic

Domain: Time

Time: Prony

Type: ◉ Isotropic ○ Traction

Preload: ◉ None ○ Uniaxial ○ Volumetric ○ Uniaxial and Volumetric

Maximum number of terms in the Prony series: 13

Allowable average root-mean-square error: 0.01

Data

	g_i Prony	k_i Prony	tau_i Prony
1	0.0738	0	436.4
2	0.147	0	0.06407
3	0.3134	0	0.0001163
4	0.3786	0	7.321E-07

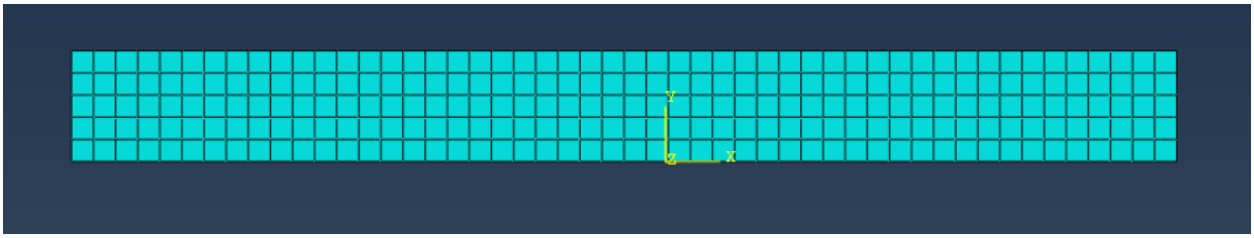
Loading and boundary conditions:

1) Right end is fixed,
2) Left end has a tensile load of 10MPa applied,
3) Step is dynamic, implicit. Duration: 1 hour (3600s). Incrementation applied.

Name: Step-1
Type: Dynamic, Implicit
Basic | Incrementation | Other
Description:
Time period: 3600
NIgeom: (•) Off ( ) On (This setting controls the inclusion of nonlinear effects of large displacements and affects subsequent steps.)
Application: Analysis product default
[ ] Include adiabatic heating effects

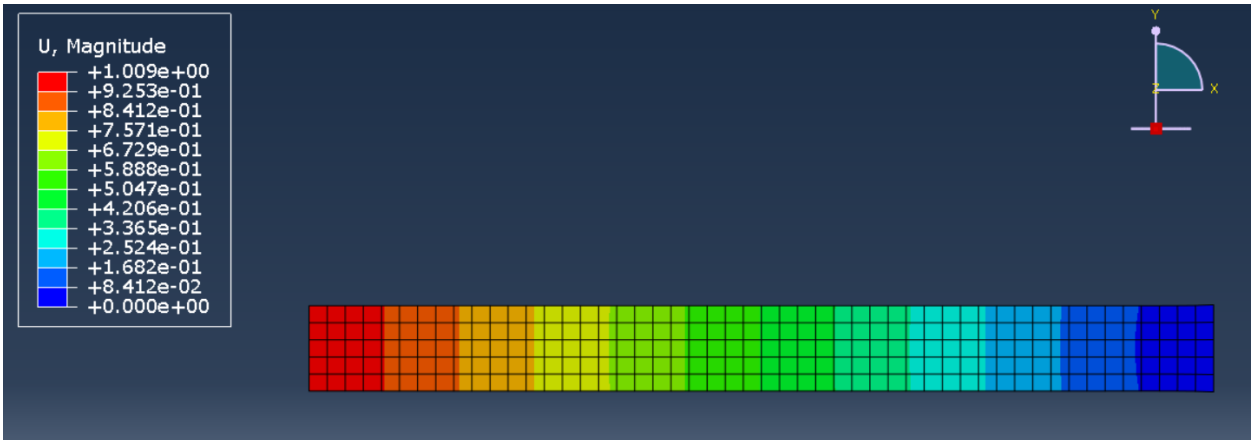
Name: Step-1
Type: Dynamic, Implicit
Basic | Incrementation | Other
Type: (•) Automatic ( ) Fixed
Maximum number of increments: 10000
Initial Minimum
Increment size: 0.1 1E-06
Maximum increment size: (•) Analysis application default
( ) Specify: 0

Mesh: (coarse due to limitation of 1000 nodes in ABAQUS educational version).

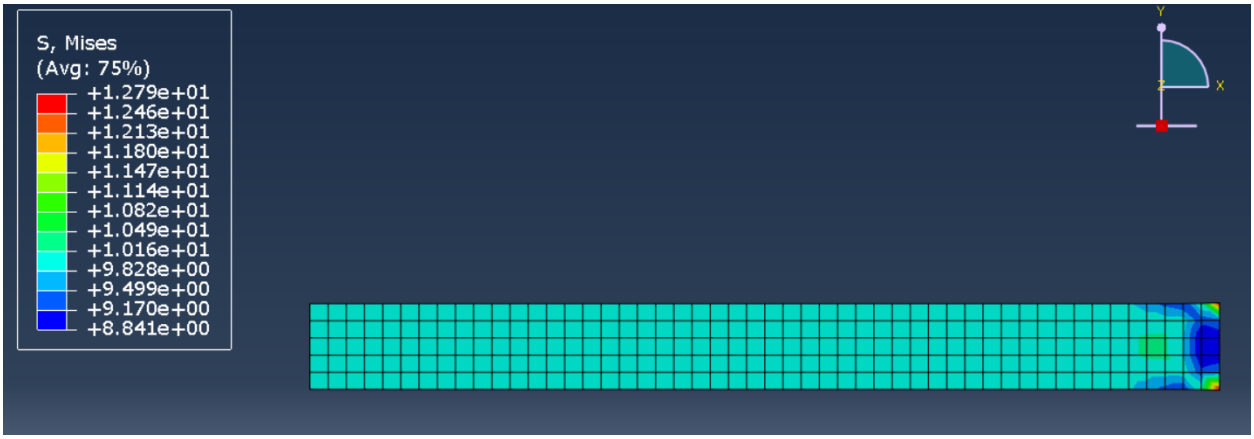


Results:

Deformation:



Mises stress:



Strain vs Time plot at a node on the left end: