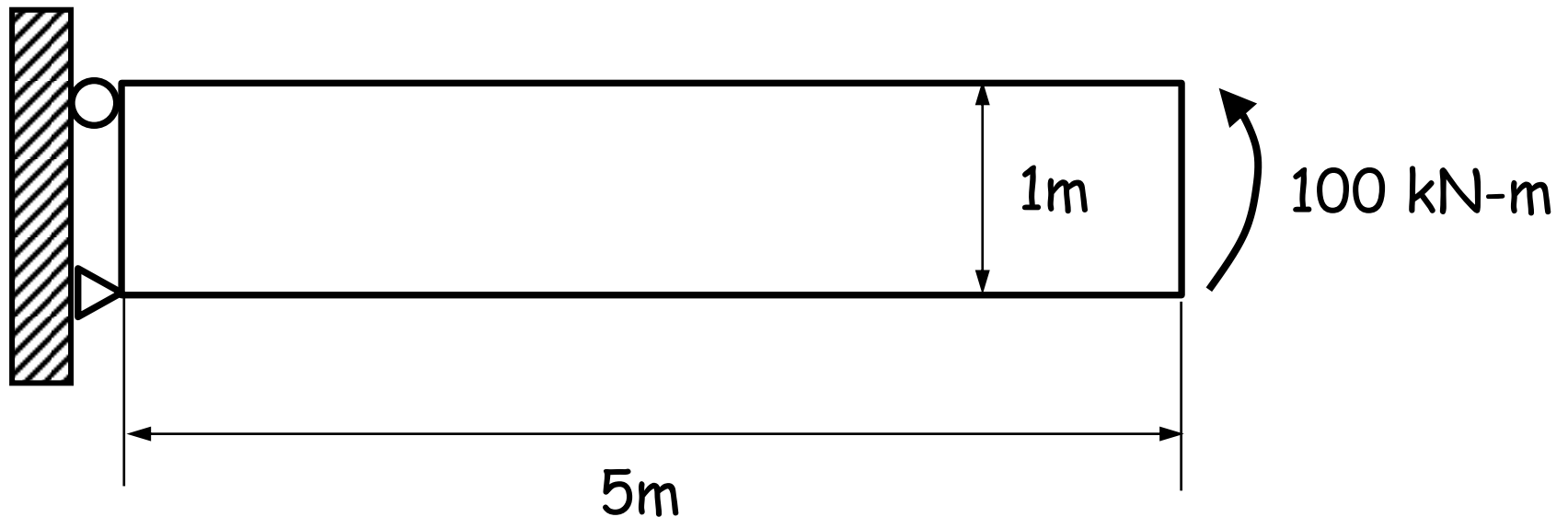


# **Tutorial 4:**

## **2D Plane (CST/Q4)**

# CANTILEVER BEAM

- $E = 200 \text{ GPa}$ ,  $\nu = 0.3$
- Thickness  $t = 0.01 \text{ m}$

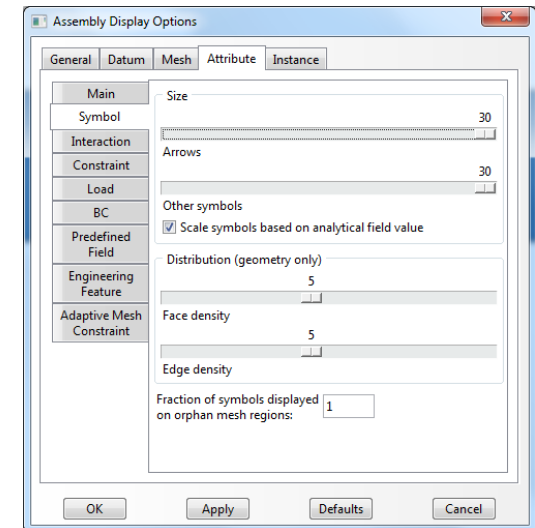
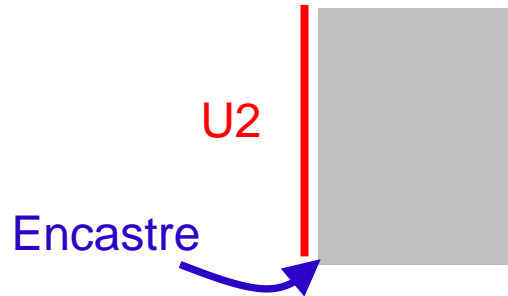


# CANTILEVER BEAM (CST)

- Parts
  - 2D Planar, Deformable, Shell, App Size = 10
  - Create lines (rectangle): (0, 0), (5, 1)
- Materials
  - Mechanical, Elasticity, Elastic
  - Young's modulus =  $200E9$ , Poisson's ratio = 0.3
- Sections
  - Solid, Homogeneous
  - Set plane stress/strain thickness to 0.01 m
- Assign the section to the part

# CANTILEVER BEAM (CST)

- Assembly, Instance
- Steps
  - Linear perturbation, Static
- BCs
  - Initial, Encastre + Displacement/Rotation, U2

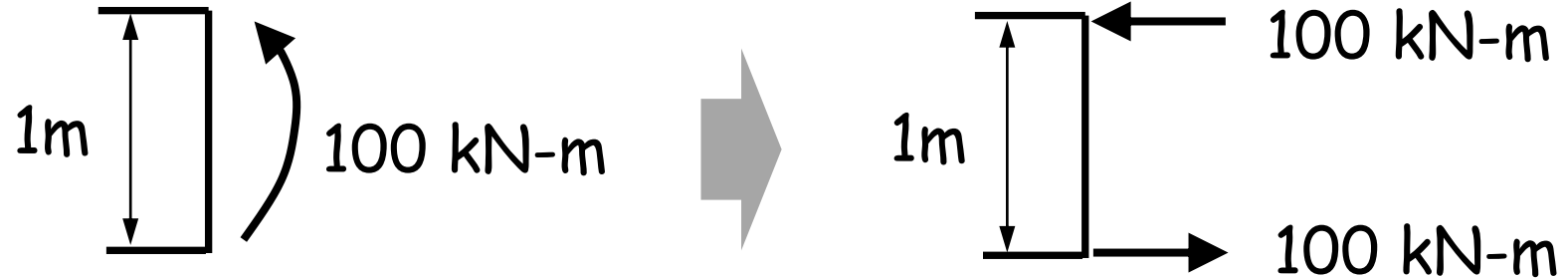


- Tip
  - To change BC symbols: View, Assembly Display Options, Attribute

# CANTILEVER BEAM (CST)

- Loads

- Mechanical, Pressure, select upward, Uniform, 30



- Mesh

- Assign Mesh Controls, Tri (Tri only)
- Global element size = 1

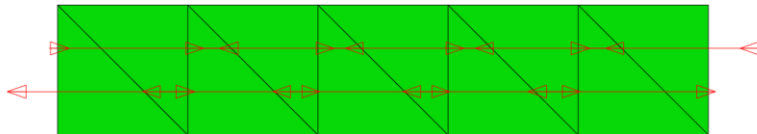
- Mesh control

- Edit Mesh, Element, Swap diagonal

# CLAMPED-CLAMPED BEAM (CST)

- Analysis, Create Job, Data Check, Submit
- Results
- Deformed plot, Stress plots
  - Field output, Mises, S11, S22, S12
  - Field output, U, U2
- Plot symbols
  - Plot stress direction
  - Make sure the "Field output tool box"

S, S11

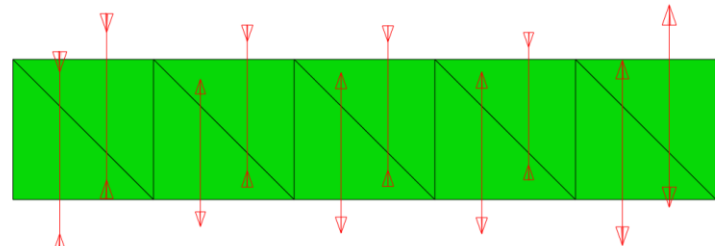


ODB: Job-1.odb Abaqus/Standard 6.9-1 Sat Oct 15 23:24:03 Eastern Daylight Time 2011

Step: Step-1  
Increment: 1; Step Time = 2.2200E-16  
Symbol Var: S, S11

S11

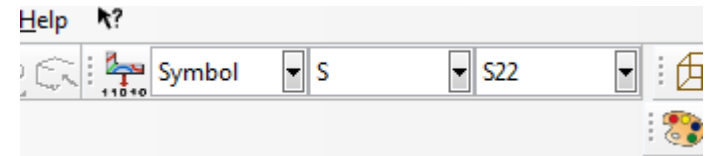
S, S22



ODB: Job-1.odb Abaqus/Standard 6.9-1 Sat Oct 15 23:24:03 Eastern Daylight Time 2011

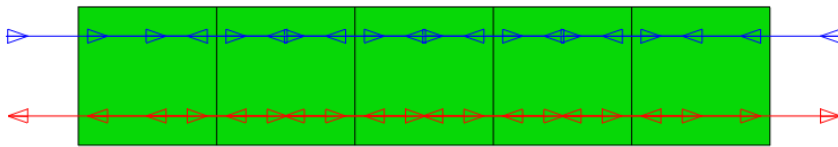
Step: Step-1  
Increment: 1; Step Time = 2.2200E-16  
Symbol Var: S, S22

S22

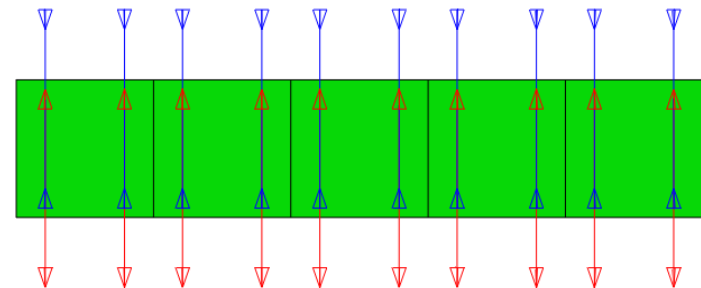


# CANTILEVER BEAM (Q4)

- The same procedures of Parts to Loads as CST
- Mesh
  - Assign Mesh Controls, Quad (Quad only)
  - Element Type, Quad tap, uncheck "Reduced integration"
  - Global element size = 1
- Analysis, Create Job, Data Check, Submit
- Results
- Plot symbols



S11



S22