**Cantilever beam example**

**Material Properties:**

Young’s Modulus E: 2.0340e11

Shear Modulus G: 7.8835e10

Density: 7850

**Geometry:**

Uniform square cross section: t = 0.02

Length: l = 25

**FEA Model:**

Number of Elements: 10

Boundary condition: clamped at left end

Loading condition: Tip load at right end

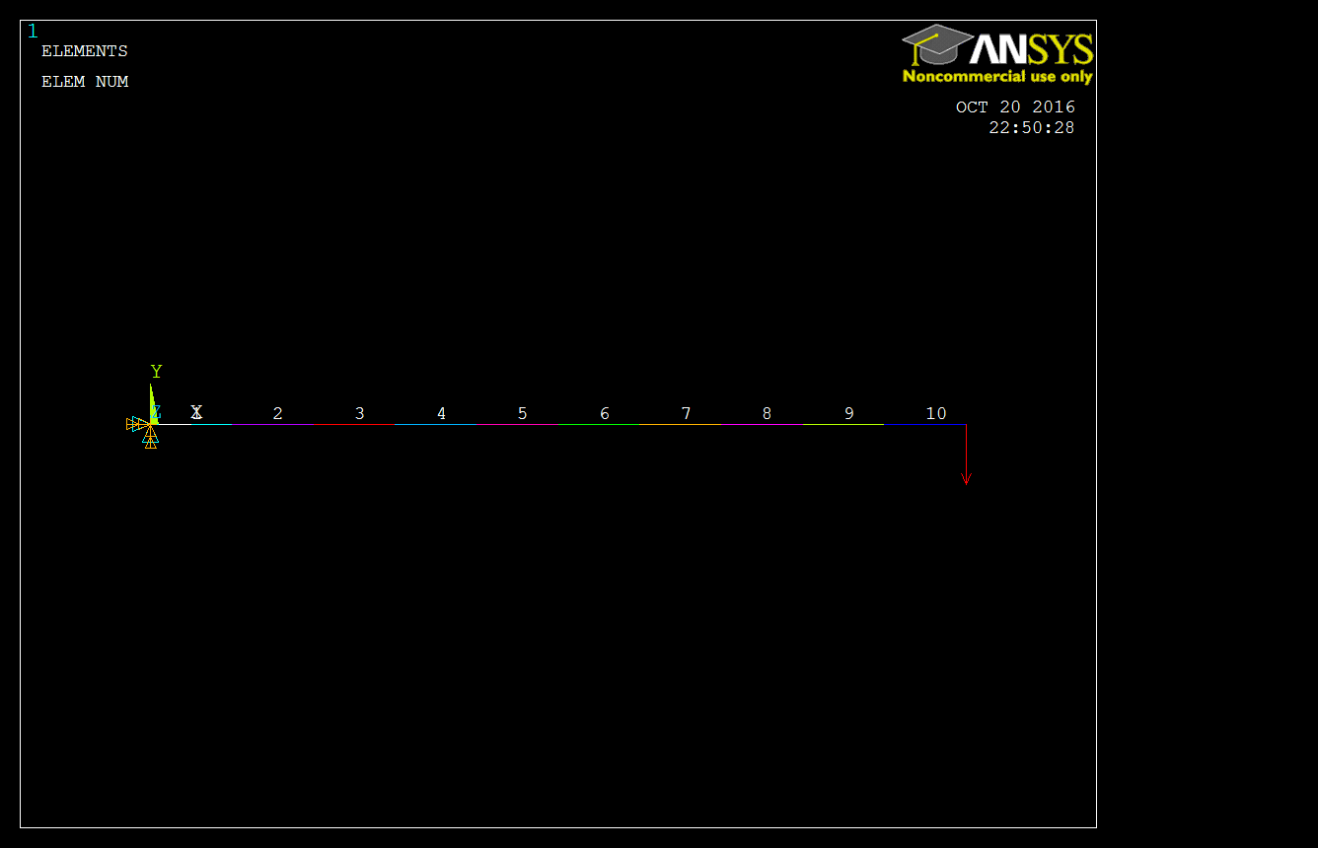


Fig. 1. FEA model with element number

**FEA Results:**

Tip deflection: -1.9166

Tip rotation: -0.11523

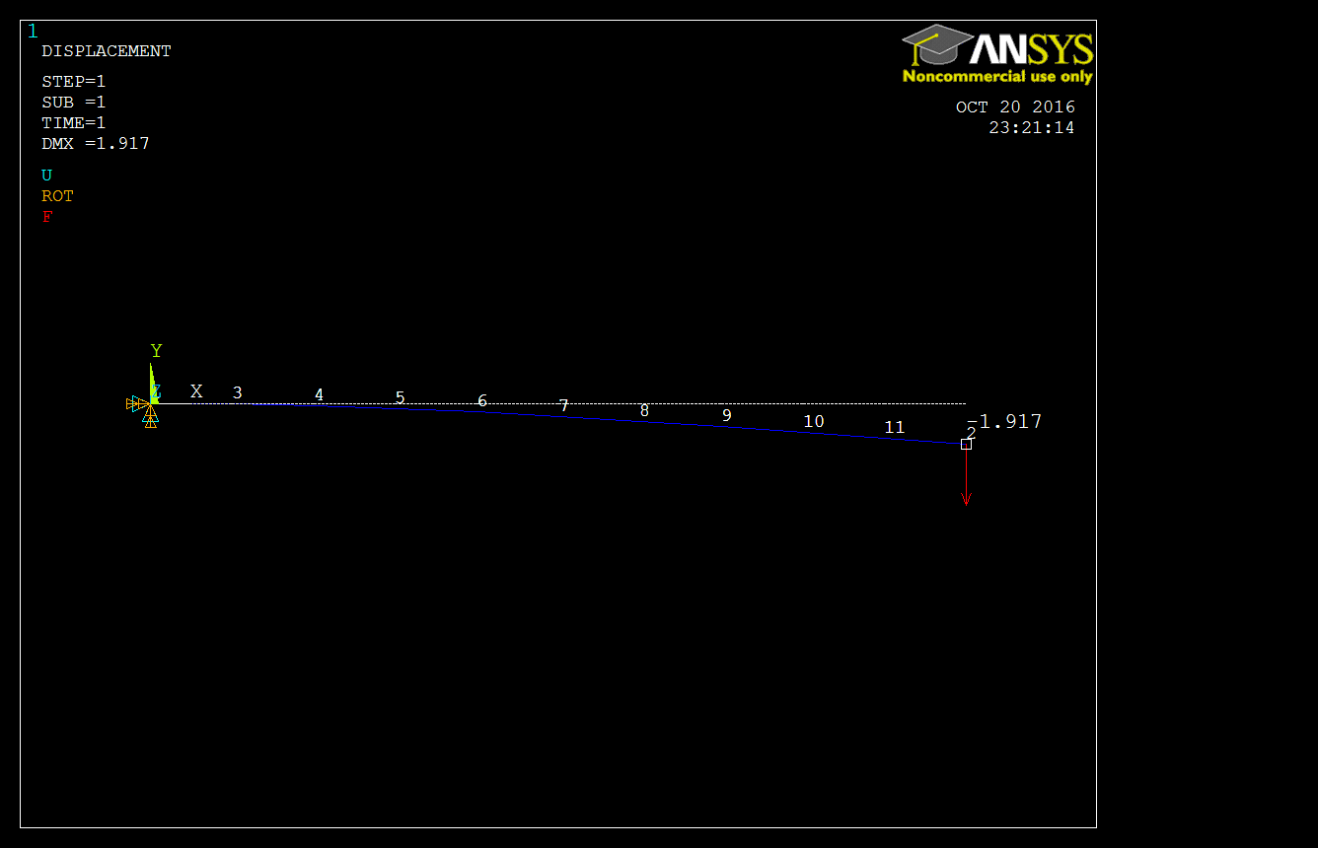
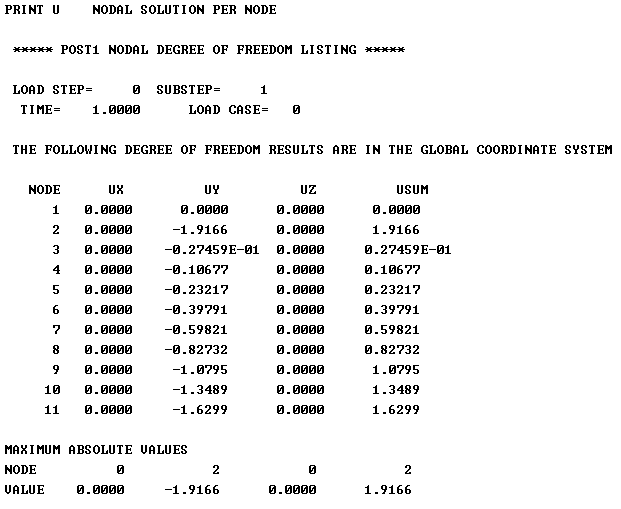


Fig. 2. Deformed shape with node number and tip deflection



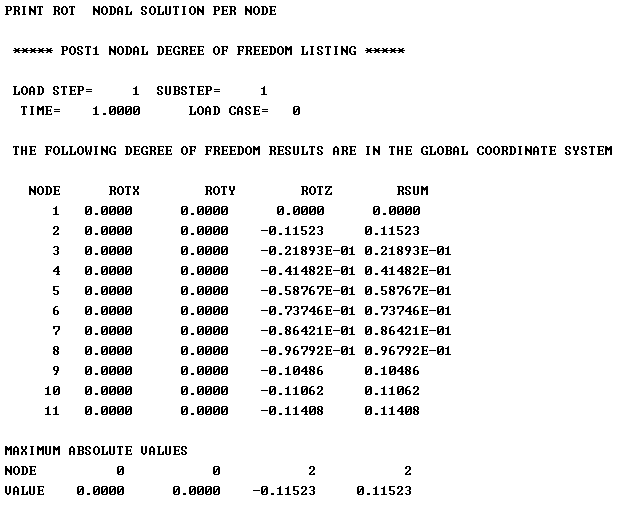


Fig. 3. Nodal DOFs

**Convergence Study**

Apply the same problem on a FEA mode with 11 elements, same tip deflection is obtained. It is convergent. 10 elements are used for this mode.

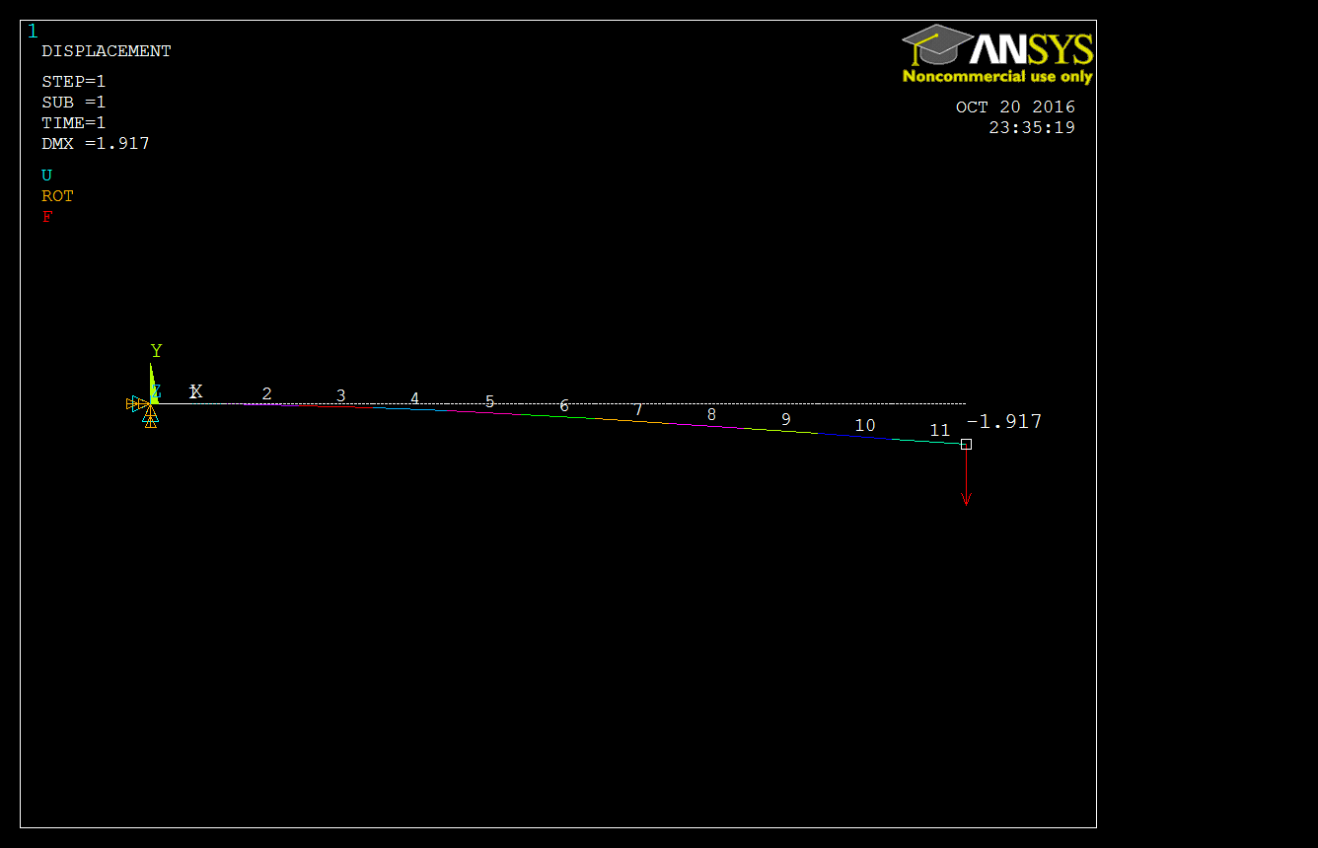


Fig. 4. Deformed shape for 11 elements with tip deflection

**WFEM Results by two-node beam element:**

Tip deflection: -1.9205

Tip rotation: -0.1152



Fig. 5. Deformed shape from WFEM

Table 1. Comparison of results by ANSYS and WFEM

|  |  |  |  |
| --- | --- | --- | --- |
|  | ANSYS | WFEM | Difference |
| Tip deflection | 1.9166 | 1.9205 | 0.203% |
| Tip rotation | 0.11523 | 0.1152 | -0.026% |