## Question 1

The simply supported beam is shown in Figure 1. The beam has a square cross section $0.05\,m \times 0.05\,m$ and a Young's modulus of $E = 3 \times 10^{11}\,Pa$, Poisson's ratio of 0.3. Create three keypoints and two lines. The size of the **BEAM3** elements is specified as $1\,m$. Determine the deflection and slope at its middle $C$.

P = 8kN
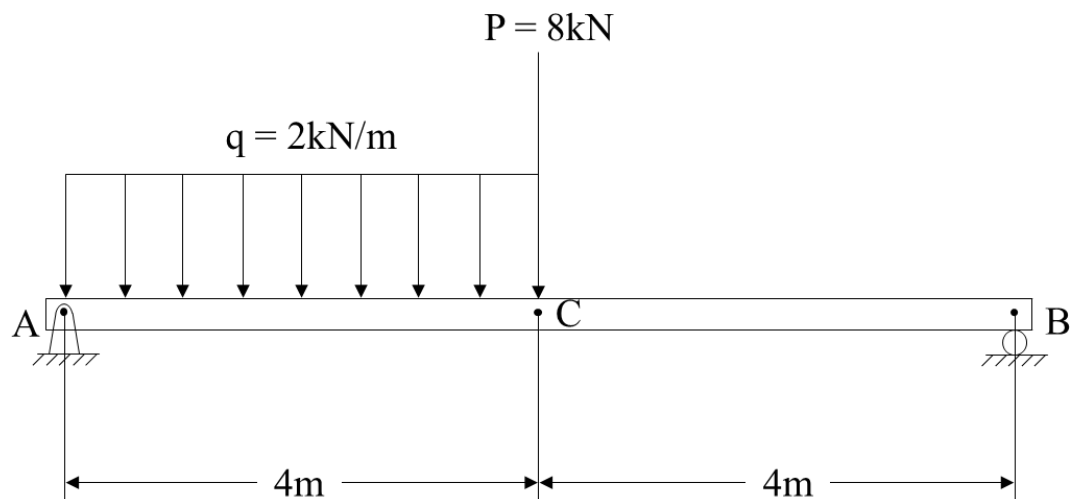
q = 2kN/m

A          C          B

4m          4m

Figure 1

The system of SI units is chosen.

## Unit

- Ansys had no build-in unit system
- The unit must be consistent.

**Table 2-1** Consistent units.

| Quantity | SI | SI (mm) | US Unit (ft) | US Unit (inch) |
|---|---|---|---|---|
| Length | m | mm | ft | in |
| Force | N | N | lbf | lbf |
| Mass | kg | tonne ($10^3$ kg) | slug | lbf s$^2$/in |
| Time | s | s | s | s |
| Stress | Pa (N/m$^2$) | MPa (N/mm$^2$) | lbf/ft$^2$ | psi (lbf/in$^2$) |
| Energy | J | mJ ($10^{-3}$ J) | ft lbf | in lbf |
| Density | kg/m$^3$ | tonne/mm$^3$ | slug/ft$^3$ | lbf s$^2$/in$^4$ |

# BEAM 3
# 2-D elastic beam
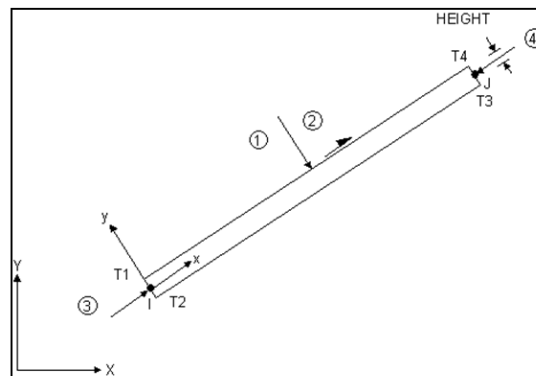


| Element Name | BEAM3 |
|---|---|
| Nodes | I, J |
| Degrees of Freedom | UX, UY, ROTZ |
| Real Constants | AREA, IZZ, HEIGHT, SHEARZ, ISTRN, ADDMAS |
| Material Properties | EX, NUXY, GXY, ALPX, DENS, DAMP |
| Surface Loads | Pressure<br>face 1, face 2, face 3, face 4 |
| Body Loads | Temperature -- T1, T2, T3, T4 |
| Special Features | Stress stiffening, Large deflection, etc. |

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/POST1
PLDISP, 1                          ! displaced structure
PRNSOL, DOF                        ! nodal solution of DOF
FINISH
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