



Academic year 2024/2025

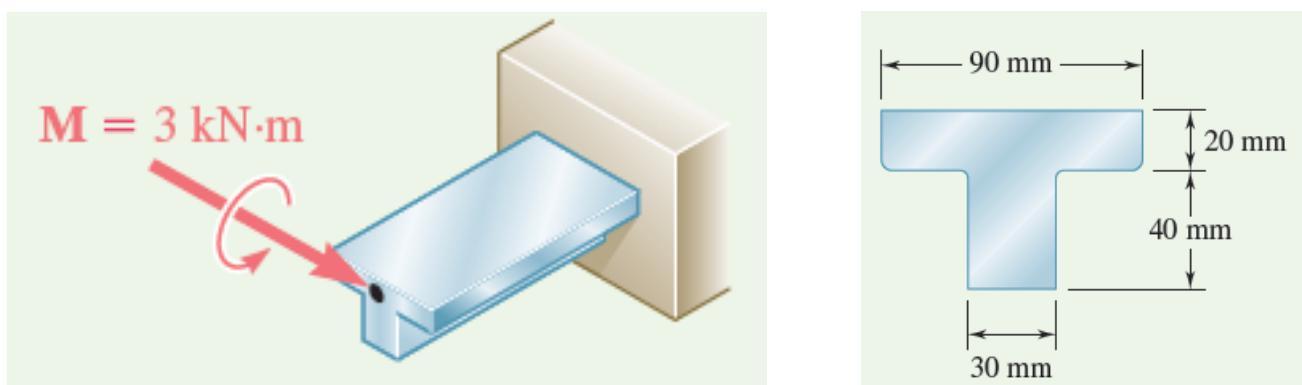
2<sup>nd</sup> Year

**Mechanics of Materials (Material Strength)**

**T.D N° 8 (Bending) [La Flexion]**

**Problem 1: (Pure Bending – Flexion pure)**

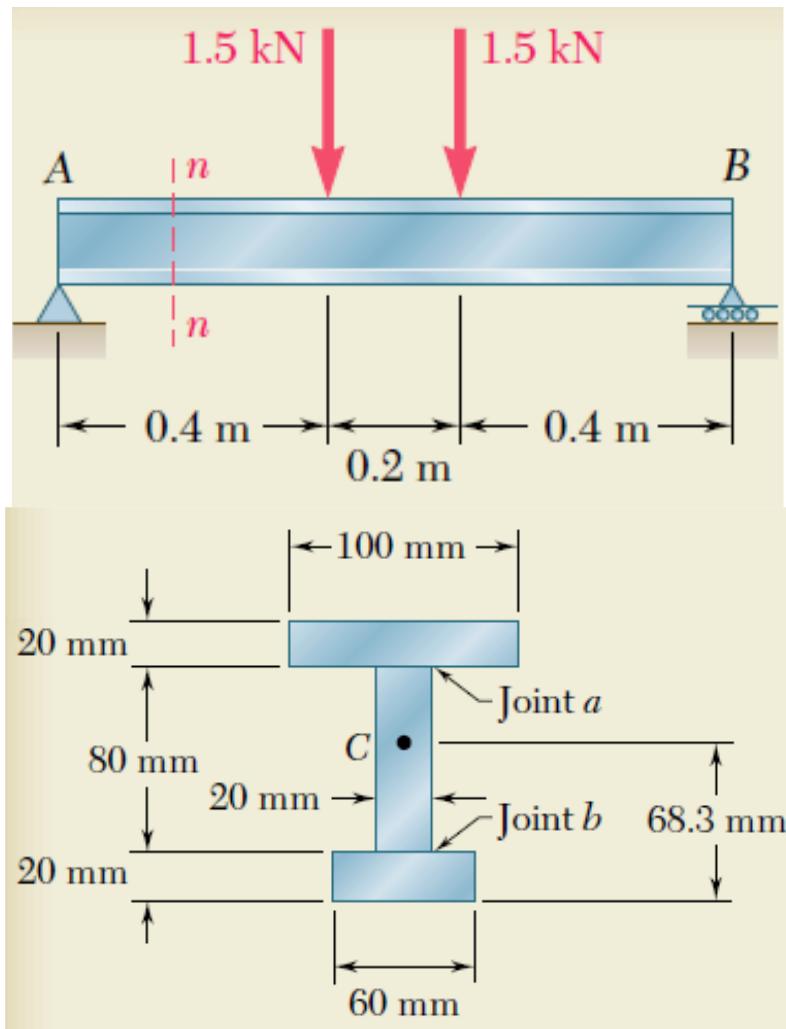
A beam with the cross sectional profile and dimensions shown in the figure is embedded in a machine and is subjected to a torque of 3 kN.m torque. Knowing that the longitudinal modulus of elasticity is  $E = 165 \text{ GPa}$ , determine the maximum tensile and compressive stresses in the beam.



**Problem 2: (Nonuniform Bending – Flexion simple)**

Beam AB is constructed by gluing three boards at joints a and b. It is subjected in its plane of symmetry to the load given in the figure. Given that the width of each glued joint is 20 mm, determine the shear stress in joint A and joint B at the n-n section of the beam. The location of the C.G of the section is shown in the figure below.

The central moment of inertia of the entire section is  $I = 8.63 \times 10^{-6} \text{ m}^4$ .



## T.D N° 9 (Shear forces and Bending Moments Diagrams [Diagrammes de l'Effort Tranchant et du moment fléchissant]

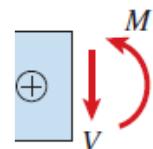
**Rappel :**

Sign convention for external loads:

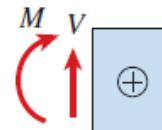
(positive upward force and positive counterclockwise moment)

Sign convention for internal loads:

(to the right of the section; the shear force T is positive downwards, the bending moment positive counterclockwise),



(left of the section; the shear force T is positive upwards, the bending moment positive clockwise).

**Problem 1 :**

Two concentrated loads are applied to a beam. Give expressions for the shear force (T) and the bending moment (M) for each segment of the beam. Draw the T and M diagrams.

