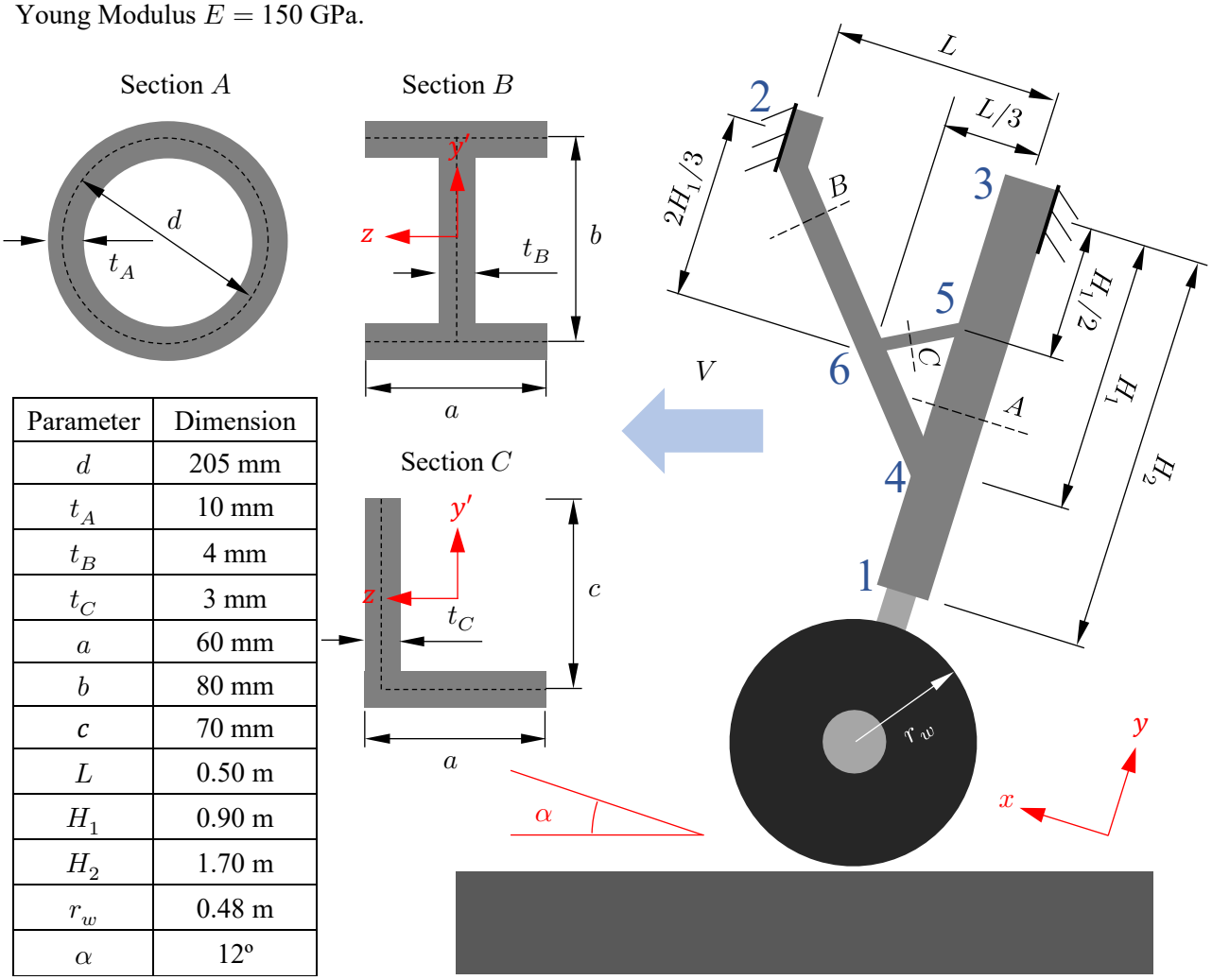
Evaluation problem

Figure 1 illustrates a schematic representation of the left-wing main landing gear an instant before touchdown, when the aircraft velocity is $V = 285$ km/h. The structure is made of a material with a Young Modulus $E = 150$ GPa.



Parameter	Dimension
d	205 mm
t_A	10 mm
t_B	4 mm
t_C	3 mm
a	60 mm
b	80 mm
c	70 mm
L	0.50 m
H_1	0.90 m
H_2	1.70 m
r_w	0.48 m
α	12º

Figure 1. Schematic representation of the left-wing main landing gear and its cross-section areas. Consider the distance between point 1 and the runway is small enough to assume the loads are applied directly in point 1.

Questions:

1. Assuming a thin-walled sections B and C ($t \ll a, b, c$) for 2-4 and 6-5 beams, respectively, compute the cross-section areas and inertias in the z-direction. Compute the normal and friction forces, N and F, assuming a wheel's mass moment of inertia of $I_0 = 330\ kg\ m^2$ and that it takes $t = 0.95\ s$ for it to reach its maximum spin velocity. Consider the friction coefficient between the tyre and the runway as $\mu = 0.4$.
2. Implement a MATLAB® code to numerically compute the displacement, rotation, shear force and bending moment distributions on the structure for the conditions in Figure 1.
3. In sections B and C, compute and sketch the shear stress (τ) and the normal stress (σ) distributions in nodes 2, 4, 6, 5.
4. Obtain the position of the maximum normal and shear stresses in sections B and C.

The assignment can be done in groups of **maximum 2 people**. Only one of the members must submit a compressed (**.zip**) file to Atenea containing the following:

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- All MATLAB® script files used in the assignment. There must be an executable script file, which must be named 'MAIN'.
- A report including:
    - A brief description of the procedure used to solve the problem.
    - The answers to the questions
        - Requested results.
    - Figures:
        - Plot of the deformed structure. Use the provided **'plotBeam2D'** function.
        - Plots of the displacements, rotations, shear force and bending moments for the numerical solution. Use the provided **'plotBeamIntForces'** function.
        - Values of the axial force, shear force and bending moments at each node for the elements 2-6, 6-4 and 6-5.
        - Shear stress (τ) and the normal stress (σ) distributions in nodes 2, 4, 6, 5

Note 1: The report can be written in Catalan, Spanish or English and both technical and presentation aspects will be considered in the grading.

Note 2: This work is half of the midterm exam.