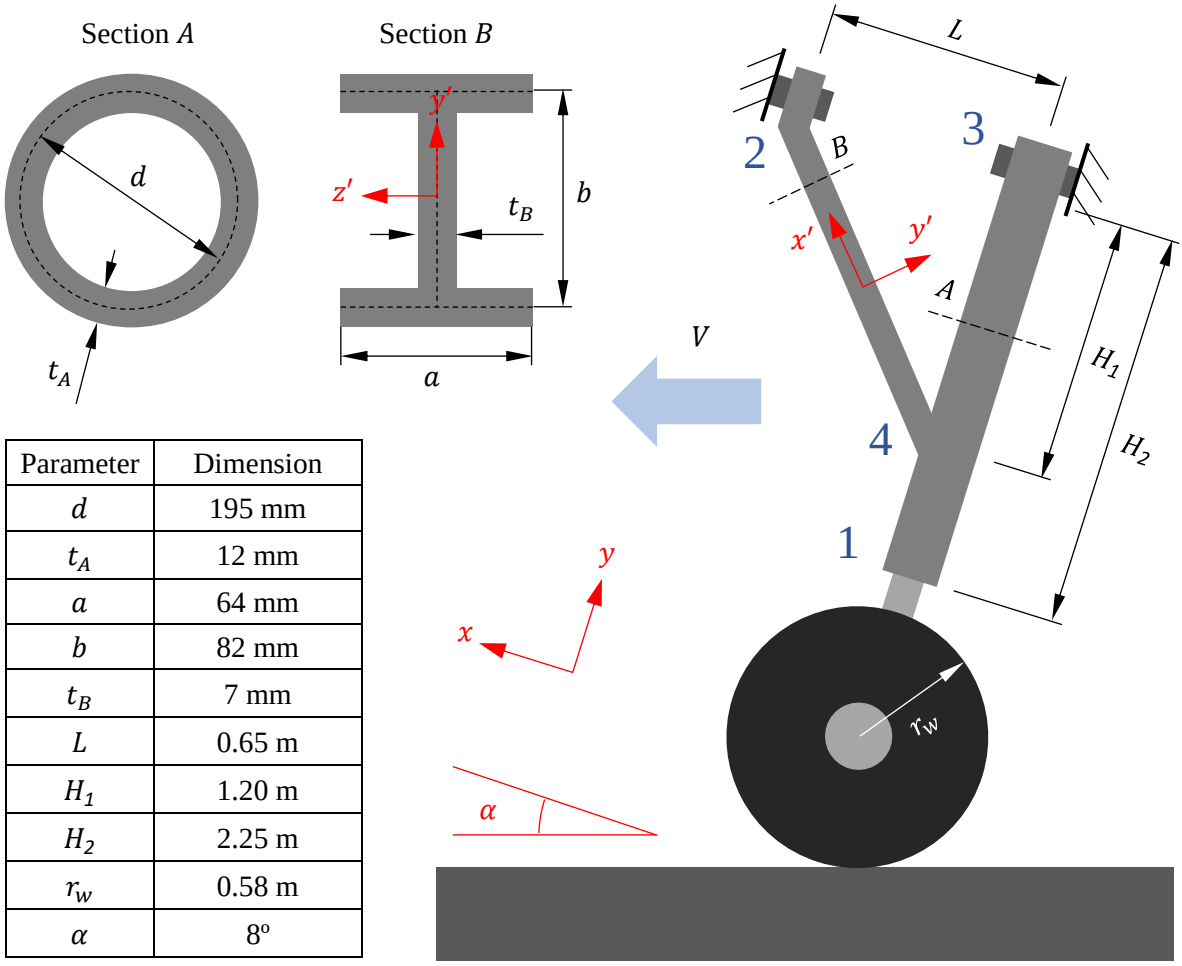
Assignment 4 – Beams 2D

Figure 1 illustrates a schematic representation of the left-wing main landing gear an instant before touchdown, when the aircraft velocity is $V = 235$ km/h. The structure is made of a material with a Young Modulus $E = 200$ GPa.



Parameter	Dimension
d	195 mm
t_A	12 mm
a	64 mm
b	82 mm
t_B	7 mm
L	0.65 m
H_1	1.20 m
H_2	2.25 m
r_w	0.58 m
α	8º

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. Compute the cross-section areas and inertias in the z-direction and the normal and friction forces, N and F, assuming a wheel's mass moment of inertia of $I_0 = 230\ kg\ m^2$ and that it takes $t = 0.75\ s$ for it to reach its maximum spin velocity. Consider the friction coefficient between the tyre and the runway as $\mu = 0.32$.
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.

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:

- All MATLAB® script files used in the assignment. There must be an executable script file, which must be named '**main_04**'.
- A report including:
    - Names of the group members
    - For part 1:
        - Requested results.
    - For part 2:
        - 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 1-3 and 2-4.
        - Values of the displacement components at node 1.

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