POLITECNICO MILANO 1863

DIPARTIMENTO DI SCIENZE E TECNOLOGIE AEROSPAZIALI

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AEROSPACE STRUCTURES

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1. The semi-momocoque wing of Figure 1 is loaded by triangular pressure distribution. Compute the rotation angle of the section located at distance l from the encastre (i.e. the location from which the pressure load starts. Refer to Table 1 for the problem data, and assume reasonable values for any missing constant.

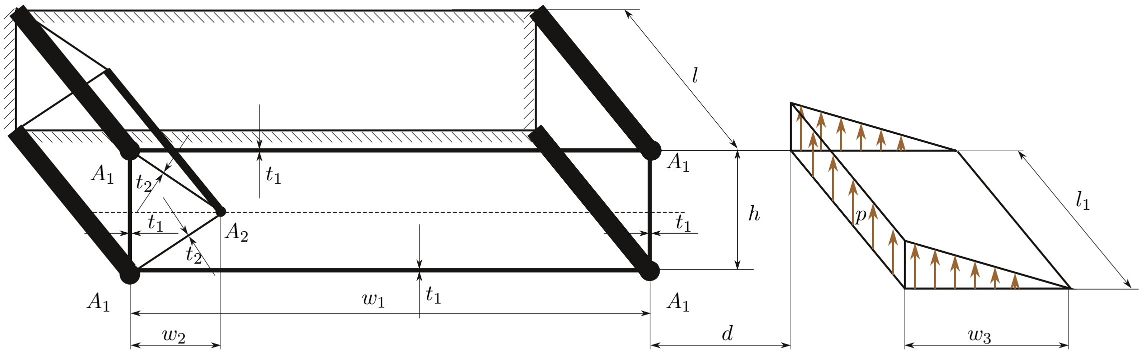

Figure 1: Loaded wing

A_1	75 mm^2	w_1	300 mm	l_1	1100 mm	E	72000 MPa
A_2	100 mm^2	w_2	40 mm	w_3	60 mm	ν	0.3
t_1	1 mm	l	3000 mm	d	20 mm		
t_2	0.5 mm	h	60 mm	p	2 MPa		

Table 1: Semi-momocoque wing data

2. The $h \times w \times t$ solid of Figure 2 is joined to a beam with torsional stiffness GJ. The beam is loaded by a moment per unit of length m. Compute the vertical displacement and the rotation of the beam free extremity. Refer to Table 2 for the problem data, and assume reasonable values for any missing constant. Choose and justify a suitable structural model for the solid.

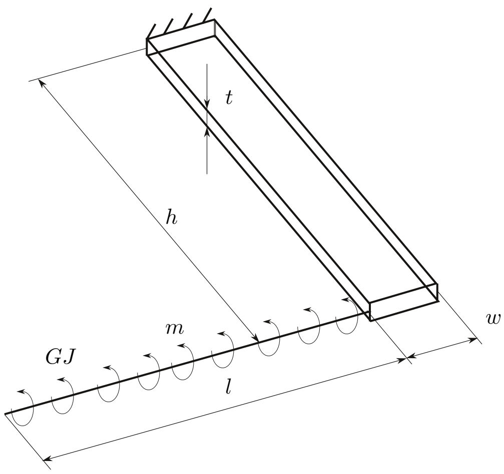

Figure 2: Cantilever bending

t	5 mm	GJ	22 Nm^2
l	1000 mm	E	72000 MPa
h	700 mm	ν	0.3
w	30 mm	m	4 N

Table 2: Semi-momocoque wing data

3. Define and derive the expression of the work-conjugated beam generalized deformation and internal actions starting from a kinematic beam model.