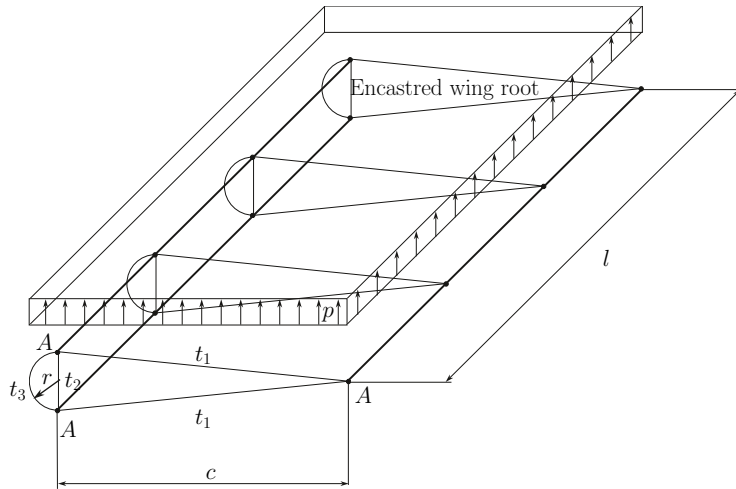


Course of Aerospace Structures

Written test, Jan 22nd, 2020

Exercise 1

The semi-monocoque wing-like structure in the figure is loaded by a constant pressure distribution. The load is introduced by four ribs, equally spaced along the wing span, as shown in the sketch. Compute the axial stress σ in the concentrated areas and the shear stress τ in the panels in the section located at $l/2$ from the wing tip.

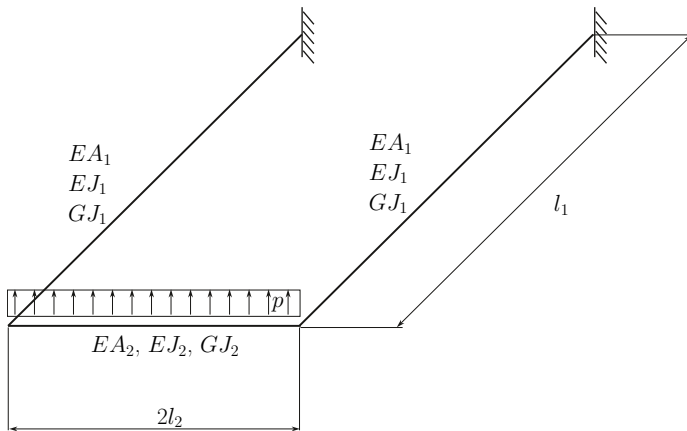


Data

$l = 6 \text{ m};$
 $c = 1 \text{ m};$
 $r = 0.1 \text{ m};$
 $A = 2500 \text{ mm}^2;$
 $t_1 = 1 \text{ mm};$
 $t_2 = 1.2 \text{ mm};$
 $t_3 = 1.5 \text{ mm};$
 $p = 0.002 \text{ MPa};$

Exercise 2

Consider the structure in the figure. Compute the constraint reaction forces and moments.



Data

$p = 3 \text{ N/mm};$
 $l_1 = 2 \text{ m};$
 $2l_2 = 1 \text{ m};$
 $E = 70000 \text{ MPa};$
 $A_1 = 1 \text{ cm}^2;$
 $A_2 = 2 \text{ cm}^2;$
 $J_1 = 1/12 \text{ cm}^4;$
 $J_2 = 1.33 \text{ cm}^4;$
 $GJ_1 = 9 \times 10^7 \text{ Nmm}^2;$
 $GJ_2 = 18 \times 10^7 \text{ Nmm}^2;$

Question 1

Illustrate how to compute the torsional stiffness of a multi-cell semi-monocoque beam.