

MT3271: EXAMPLE SHEET¹ VIII

1.) What is the necessary relationship between the constants A and B if

$$\phi = Ax_1^2x_2^3 + Bx_2^5$$

is to serve as an Airy stress function?

2.) a) Show that

$$\phi = \frac{3F}{4c} \left(x_1x_2 - \frac{x_1x_2^3}{3c^2} \right) + \frac{P}{4c}x_2^2$$

is a valid Airy stress function.

- b) Now assume that ϕ describes the stress field in the cantilever beam of thickness $2c$, as sketched in Fig. 1. Determine the stress field and consider the physical meaning of the constants F and P [Hint: Examine the resultant forces at the left end of the beam].
- c) Given the physical interpretation from part (b), explain why τ_{11} increases linearly with x_1 . [Hint: Examine the balance of moments about the point $(x_1, 0)$].

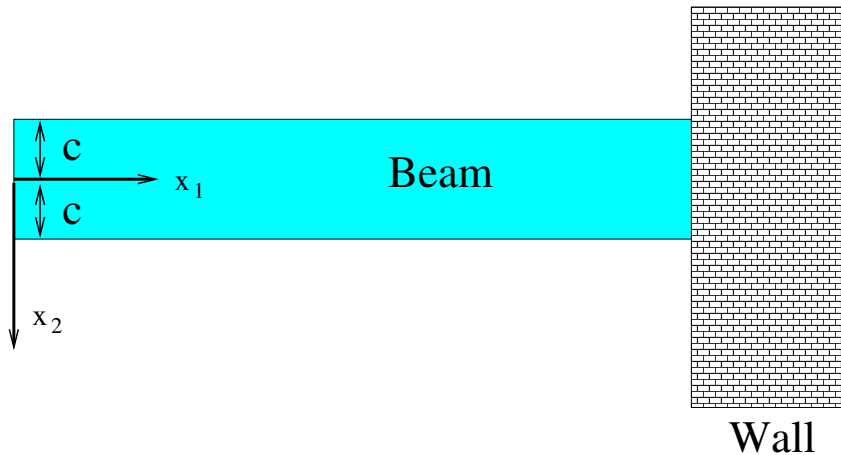


Figure 1: Sketch of a cantilever beam.

Coursework

Please hand in the solution to questions 2a,b by Wednesday (in 1 1/2 week's time). Please place them into the file in Dr. Heil's pigeonhole in the general office on the 4th floor.

¹Any feedback to: M.Heil@maths.man.ac.uk