MT3271: EXAMPLE SHEET[1] 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 $(x_1, 0)$].

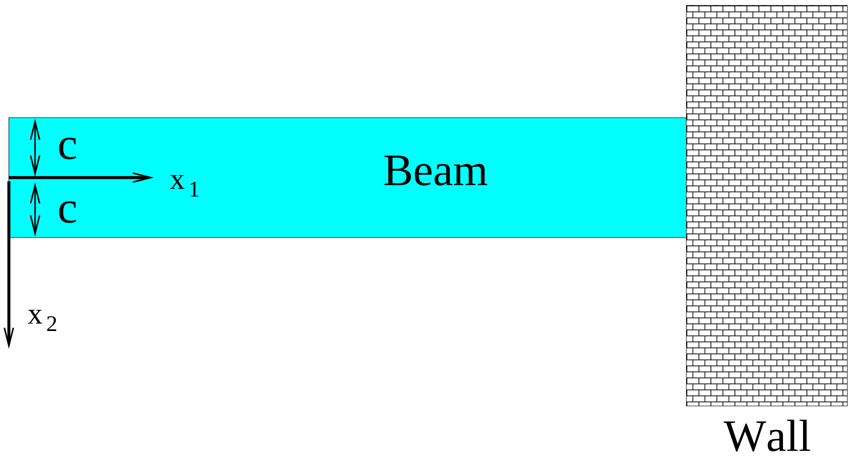

Figure 1: Sketch of a cantilever beam.

Coursework

Please hand in the solution to questions 2a,b by Friday, December 1, 20 00. Please place them into the file in Dr. Heil's pigeonhole in the general office on the 4th floor.

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