GX506

OLLSCOIL na hÉIREANN, GAILLIMH

NATIONAL UNIVERSITY OF IRELAND, GALWAY

SECOND SEMESTER EXAMINATIONS, 2000

SECOND ENGINEERING EXAMINATION

STRENGTH OF MATERIALS

Professor R. Falconer
Professor P. O'Donoghue
Dr. A.M. Harte

Time allowed: *Two* hours
Answer *three* questions

---

1. For the beam shown in Figure 1, determine the support reactions and draw and dimension the shear force and bending moment diagrams.

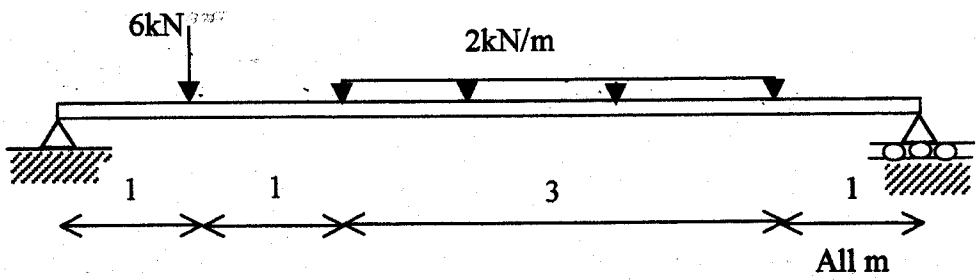

Figure 1

2. An 8m long, simply supported I-beam carries a uniformly distributed load of 10kN/m over its entire length. The beam section is unsymmetric as shown in Figure 2. Find the maximum tensile and compressive bending stresses in the section.

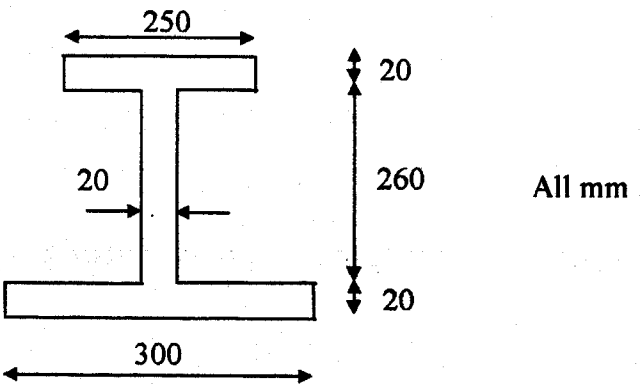

Figure 2

3. Stating your assumptions clearly and defining the symbols used, derive the fourth order differential equation governing the deflection of a prismatic, elastic beam.

$$EI\frac{d^4v}{dx^4} = q(x)$$

Using the direct integration method, find the midspan deflection of the prismatic beam shown in Figure 3.

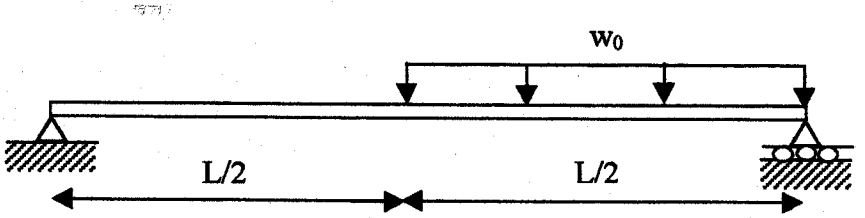

Figure 3

4. Stating your assumptions clearly and defining the symbols used derive the shear stress formula for beams.

$$\tau = \frac{QA\bar{y}}{Ib}$$

A box beam is 100mm wide, 150mm deep and has a uniform wall thickness of 10mm. Determine the maximum shear stress at a section where the shear force is 15kN.