

CSE201 Structural Mechanics I  
**Assignment No. 3**

**Due date:** 27<sup>th</sup> November 2007

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**Question 1.** Draw the axial force, shear force and bending moment diagram for all members of the frame shown in Figure 1. Note the frame is pin connected at A, C and D but rigidly fixed joint at B.

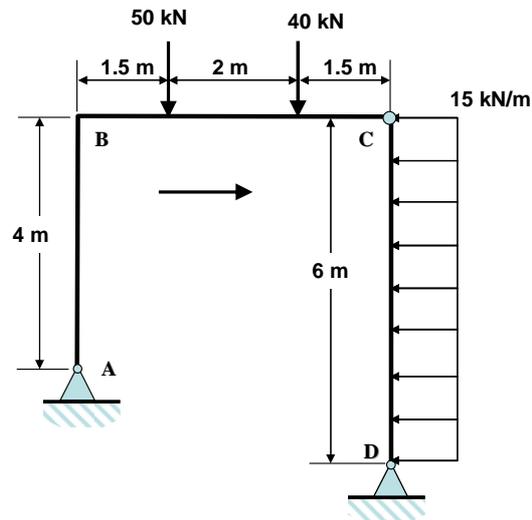


Figure 1

**Question 2.** Calculate the maximum shear stress, angle of twist and strain energy of the following: (Assuming that the shaft is 2m long, the applied torque is 10kNm and  $G=80\text{kN/mm}^2$ )

- (a) a solid circular shaft of 50mm in diameter.
- (b) A hollow circular shaft with outer diameter of 100mm and thickness of 3mm.
- (c) A hollow square tube of outer dimension of 80mm square and 5mm thickness. Use Bredt-Batho Theory in your analysis.

**Question 3.** Figure 2 shows an idealised diagram of a model bridge. Beam BC is freely supported at its ends on two similar cantilever beams AB and CD. The cross-sections of all the beams are similar and is shown in Figure 2(a).

The allowable bending stresses for the material of the model are 80 MPa in compression and 160 MPa in tension. Find the maximum uniformly distributed load ( $w$  kN/m) that can be allowed on span BC so that every part of the model is within the allowable bending stresses. *Note that the location of centroid and  $I_{xx}$  are given on the Figure.*

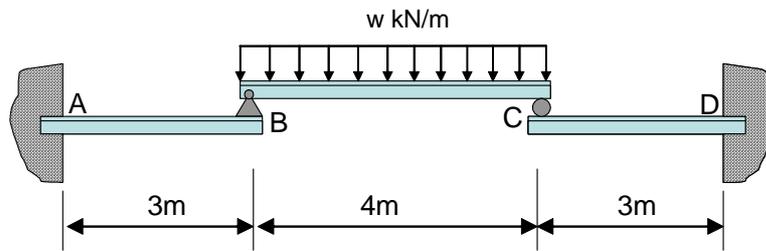


Figure 2

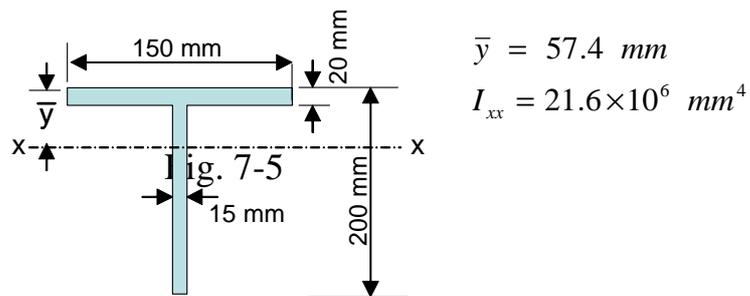


Figure 2(a)

**Question 3.** For the beam and loading shown, determine (a) the equation of the elastic curve for portion BC of the beam; (b) the deflection at mid-span; (c) the slope at B.

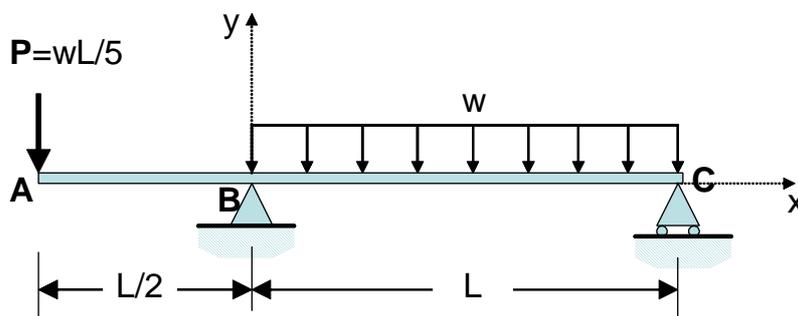


Figure 3