

UNIVERSITY OF TORONTO
Department of Civil Engineering

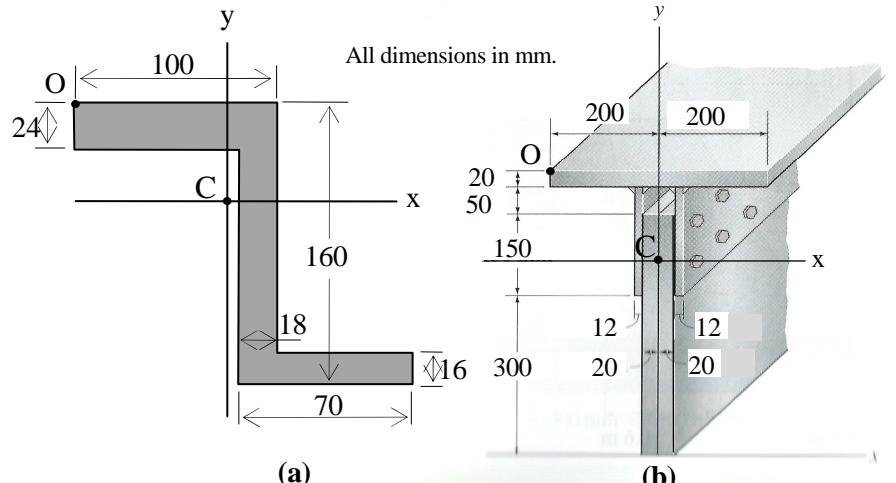
CIV100F - MECHANICS – GROUP G (107)

Problem Set 12

Due: 4:00 pm on Friday November 30, 2012

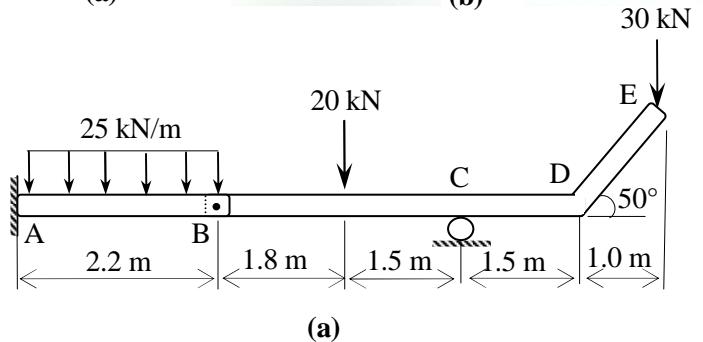
In SF3201

1. Determine the second moments of areas (i.e., moments of inertias) of the cross sections **(a)** and **(b)** for bending about their centroidal x and y axes. Determine the centroids of the cross sections with reference to origin O. (You may obtain the centroid location of **(a)** from Problem Set 9.)



2. Beam ABCDE, supported by a fixed connection at A, an internal pin at B and a roller at C, is subjected to a uniformly-distributed load and two point loads as shown in figure (a). The beam is to be constructed from the structural steel with the yield strength of 350 MPa in both tension and compression.

- i.) Neatly draw the shear and bending moment diagrams for beam ABCD and indicate all key values.
 - ii.) Beam ABCD is to be designed using a uniform-thickness hollow structural steel section shown in figure (b). Using a load factor of 1.9, determine the minimum thickness t required. Thicknesses are only available in 2 mm increments.



3. The maximum internal service moment on a beam is calculated to be 50 kNm. This beam is to be designed for a load factor of 2.0 and using a channel section having the yield stress of 300 MPa in both tension and compression.

- i.) Select a suitable section to minimize the material cost.

- ii.) Select a suitable section to minimize the depth of the beam due to an overhead clearance requirement enforced by the city.

