Université d'Ottawa
Faculté de génie

Département de
génie civil

University of Ottawa
Faculty of Engineering

Department of
Civil Engineering

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L'Université canadienne
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CVG 2140: Mechanics of Materials I

Midterm Exam / Examen de mi-session **February/ Février 16, 2011**
Dr. B. Martín-Pérez Time / Temps: **80 min.**

CLOSED BOOK. Attempt all three problems. Non-programmable calculators are allowed. Marks are as shown for each question. Clearly indicate the **coordinates** you are using.

LIVRE FERMÉ. Essayez de répondre aux trois questions. On permet des calculatrices non programmables. Les points sont indiqués pour chaque question. Identifiez clairement le **système de coordonnées** que vous utilisez.

Name of the student / Nom de l'étudiant: _____

Student Number / Numéro d'étudiant: _____

1. For the simply-supported beam illustrated in Fig. 1:
    a. Determine the support reactions at A and B. (10 points)
    b. Draw the shear and bending moment diagrams. (20 points)

2. Determine the maximum and minimum moments of inertia of the shape illustrated in Fig. 2 with respect to its centroidal axes. (30 points)

3. A solid aluminum (E_{al} = 70 GPa) rod is connected to a solid bronze (E_{br} = 100 GPa) rod at flange *B*, as shown in Fig. 3. The aluminum rod has an outside diameter of 35 mm, whereas the bronze rod has an outside diameter of 20 mm. Knowing that the axial stress in the aluminum rod must be limited to 160 MPa, and the axial stress in the bronze rod must be limited to 110 MPa, determine:
    a. The maximum load *P* that can be applied at *B*; (20 points)
    b. The displacement of *B* for the load *P* determined in (a) (10 points)

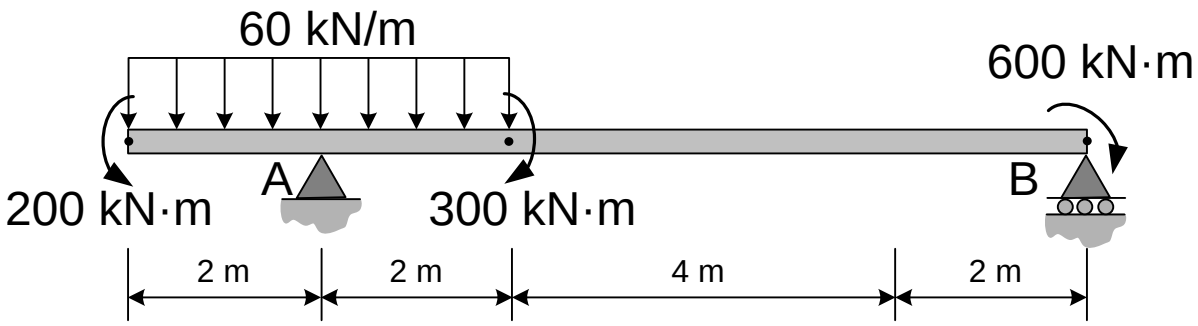

Figure 1

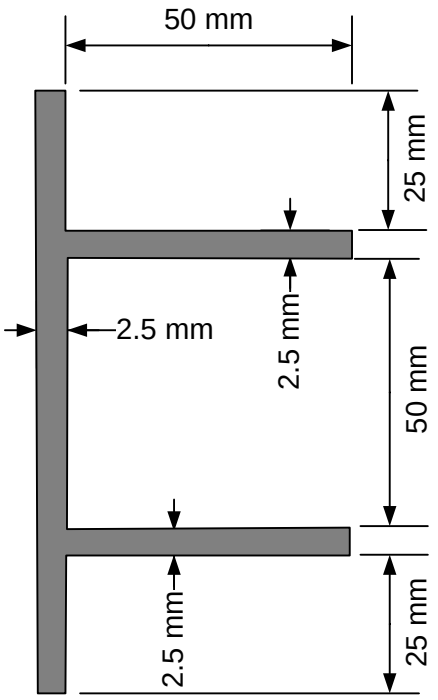

Figure 2

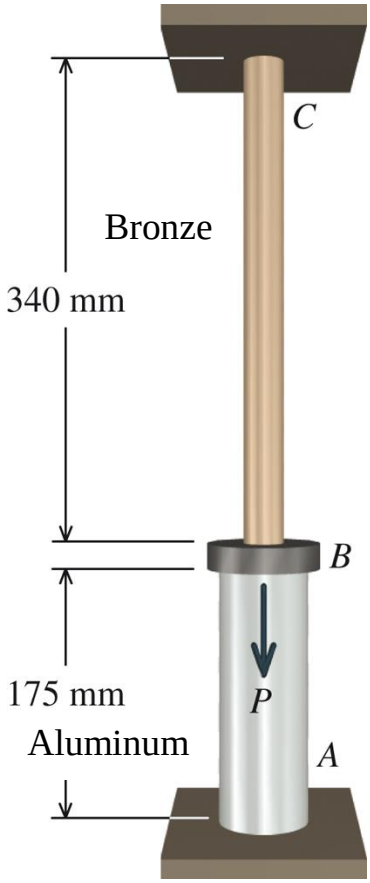

Figure 3