Université d'Ottawa
Faculté de génie

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University of Ottawa
Faculty of Engineering

Department of
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CVG 2140: Mechanics of Materials I

Midterm Exam / Examen de mi-session **March/ Mars 2, 2012**
Drs. H. Aoude, R. Flores-Vera, 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.

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

StudentNumber / Numéro d'étudiant:_____

1. For the shape illustrated in Fig. 1, for which the location of the centroid is given by $\bar{x} = 50\,\text{mm}$ and $\bar{y} = 21.8\,\text{mm}$ with respect to the bottom left corner, determine:
   a. The moment of inertias I_{Xc}, I_{Yc} with respect to its centroidal axes; and, (20 points)
   b. The maximum and minimum moments of inertia with respect to its centroidal axes. (10 points)

2. For the beam illustrated in Fig. 2:
   a. Determine the support reactions; (10 points)
   b. Draw the shear and bending moment diagrams.(20 points)

3. Consider the axial member shown in Fig. 3 made of two materials: steel (E_{st}=200 GPa) and aluminum (E_{al} =70 GPa). Segment AB has circular cross section with diameter d_{AB} = 300 mm, and segment BC has a circular cross section with diameter d_{BC} = 600mm. Determine the displacement of A with respect to C. (30 points)

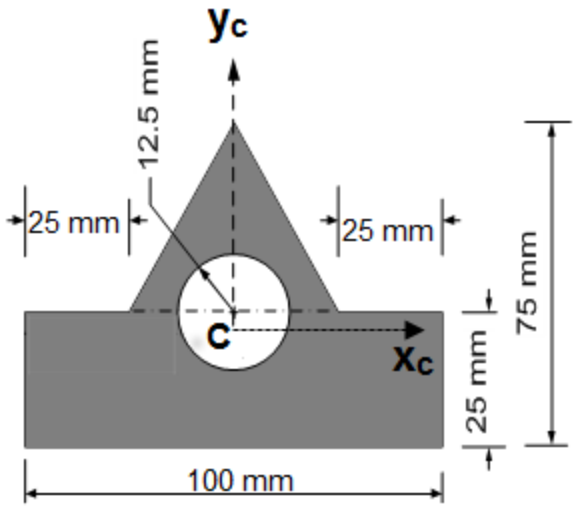

Figure 1

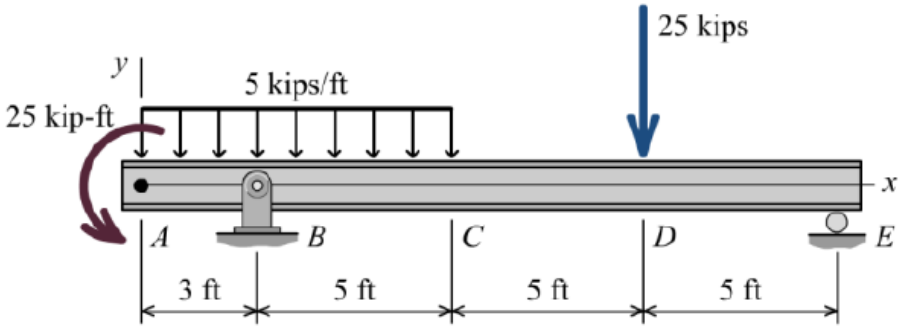

Figure 2

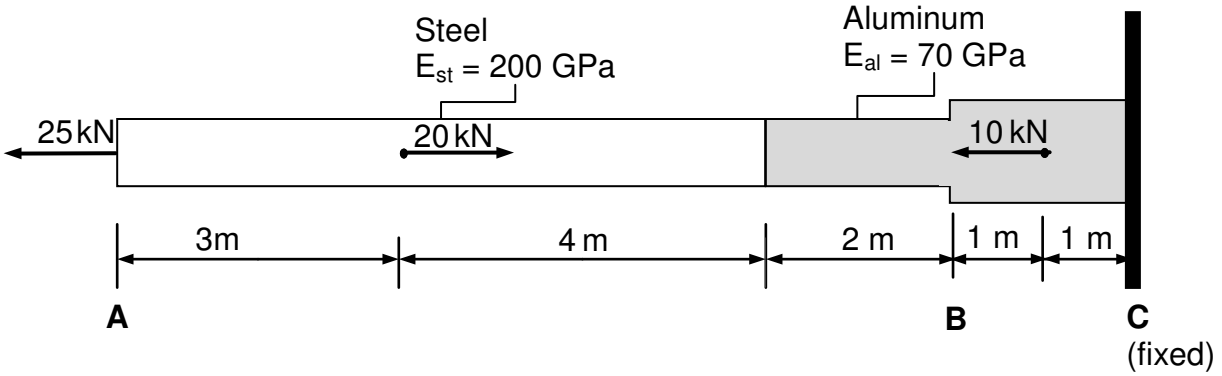

Figure 3