1. Determine the maximum cable force, if the uniform distributed loading $w_0 = 70 \, kN/m$. (25%)

2. Beam AB is subjected to a uniform load of 200N/m and is supported at B by post BC. If the coefficients of static friction at B and C are $\mu_B = 0.2$ and $\mu_C = 0.5$, determine the force P needed to pull the post out from under the beam. Neglect the weight of the members and the thickness of the beam. (25%)

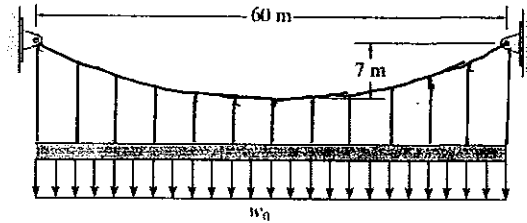國立交通大學 102 學年度碩士班考試入學試題

科目：工程力學(3052)　　　　　　　　　考試日期：102 年 2 月 4 日 第 2 節
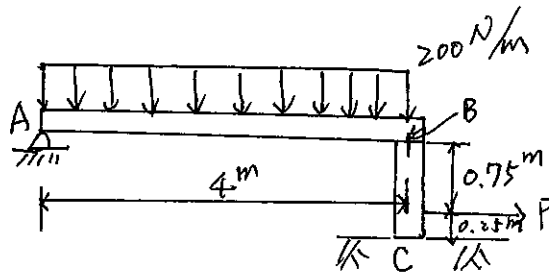系所班別：土木工程學系　　　組別：土木系甲組一般生　　　　第 2 頁,共 2 頁
【可使用計算機】＊作答前請先核對試題、答案卷(試卷)與准考證之所組別與考科是否相符！！

3. The transformation equations for plane strain are

$$\varepsilon_{x_1} = \frac{\varepsilon_x + \varepsilon_y}{2} + \frac{\varepsilon_x - \varepsilon_y}{2}\cos 2\theta + \frac{\gamma_{xy}}{2}\sin 2\theta,$$

$$\frac{\gamma_{x_1 y_1}}{2} = -\frac{\varepsilon_x - \varepsilon_y}{2}\sin 2\theta + \frac{\gamma_{xy}}{2}\cos 2\theta.$$

Here axes $x_1 y_1$ are rotated through a counterclockwise angle θ from xy axes.

A. Derive the above transformation equations from the deformations of an element in plane strain. (10%)

B. On the surface of a structural component in a space vehicle made of pure aluminum ($E = 70GPa$, $v = 0.33$), the strains are monitored by means of three strain gages arranged as shown in the figure. The measured strains are $\varepsilon_A = 1200 \times 10^{-6}$, $\varepsilon_B = 200 \times 10^{-6}$, and $\varepsilon_C = 200 \times 10^{-6}$. Determine the principal strains and principal stresses in the material. (Show the principal strains and principal stresses on sketches of properly oriented elements.) (20%)
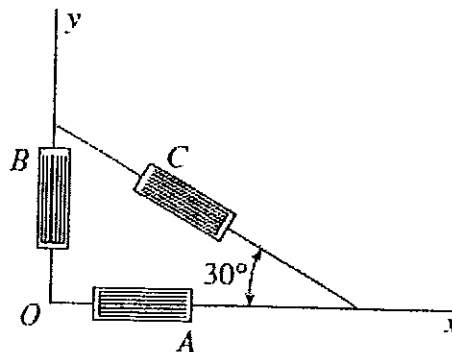
4. A bar having a circular cross section of 36mm diameter is 2m long and is held upward. If it has a mass of 6kg/m, determine the largest angle θ measured from the vertical, at which it can be supported before it is subjected to a tensile stress near the grip. (20%)