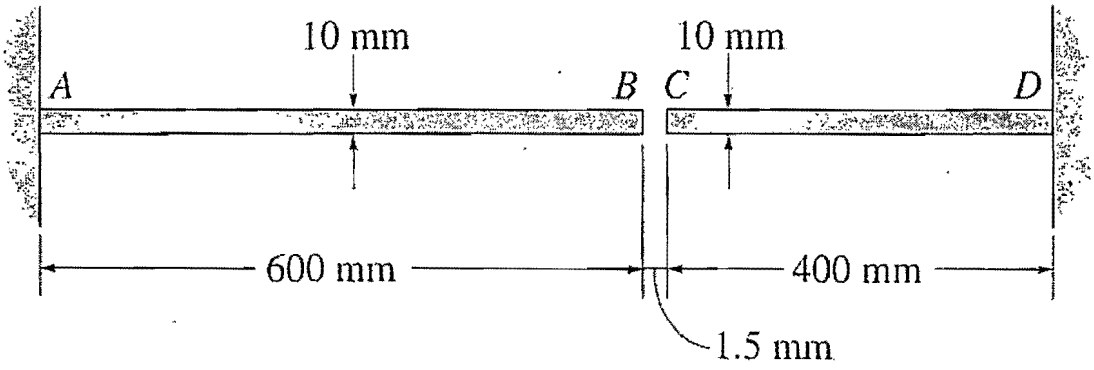
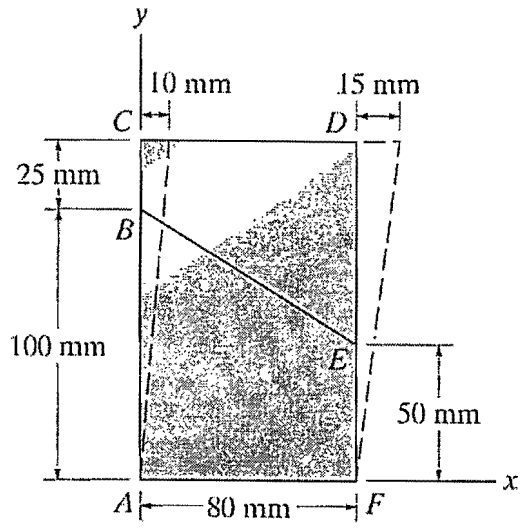
國立雲林科技大學
100學年度碩士班暨碩士在職專班招生考試試題

系所：機械系
科目：材料力學

1. A thermo gate consists of a 6061-T6-aluminum plate AB and an Am-1004-T61-magnesium plate CD, each having a width of 15 mm and fixed supported at their ends. (a) If the gap between them is 1.5 mm when the temperature is $T_1 = 25^0C$, determine the temperature required to just close the gap. (b) Also, what is the axial force in each plate if the temperature becomes $T_2 = 100^0C$? Assuming bending or buckling will not occur. The Young's modulus and coefficient of thermal expansion for both materials are as follows:
$E_{al} = 68.9GPa$, $\alpha_{al} = 24\text{x}10^{-6}/^0C$ for aluminum
$E_{mg} = 44.7GPa$, $\alpha_{mg} = 26\text{x}10^{-6}/^0C$ for magnesium [25%]



2. The material distorts into the dashed position shown. Determine (a) the average normal strains ε_x, ε_y and the shear strain γ_{xy} at A, and (b) the average normal strain along line AD. [25%]



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3. A cantilever beam AB carrying two concentrated loads P (Fig.3) has a rectangular cross section of width b and height h. (a) Determine the reaction for the beam. (b) Construct the shear-force and bending-moment diagrams for the beam. (c) Determine the maximum bending and transverse shear stress in the beam. (25%)

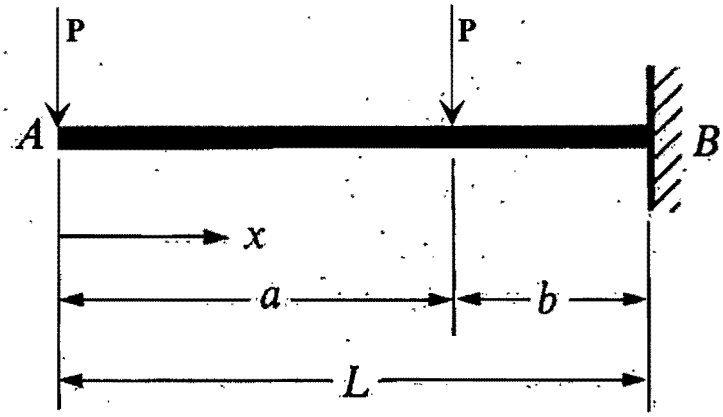

Fig.3

4. Due to the applied loading, the element at point A on the outer surface of solid cylinder in Fig.4 is subjected to the state of stress. (a) Make a sketch for the view of stress of element A and show the values of the stress. (b) Determine the principal stresses acting at element A. (c) Determine the maximum in-plane shear stress at element A. (25%)

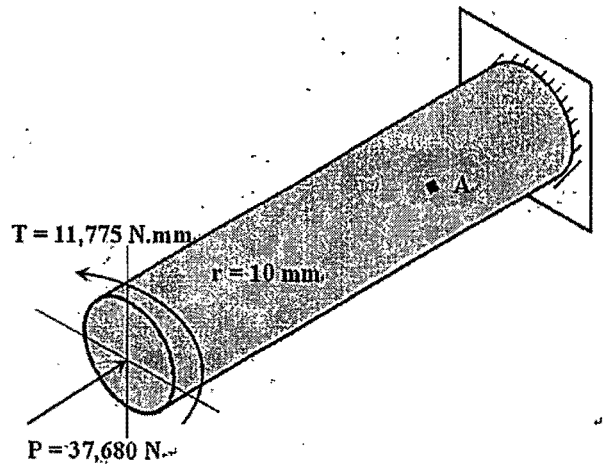

Fig.4