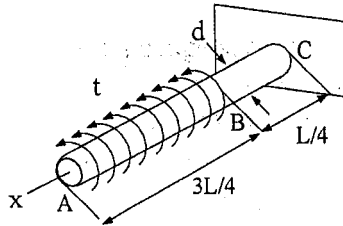
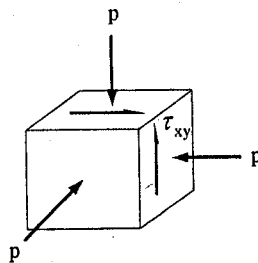


所別：機械工程學系碩士班 甲組(固力與設計) 科目：材料力學
生物醫學工程研究所碩士班

1. A metallic, tensile specimen has a gauge section with a cross-sectional area of 30 mm^2 and a length of 50 mm. During tensile testing, this specimen is pulled until fracture occurs. The cross-sectional area at the point of fracture is 12 mm^2 and the gauge length at fracture is 70 mm. The engineering fracture strength is 300 MPa. Calculate the ductility in terms of percent reduction of area and percent elongation. Also calculate the true stress at fracture. (10%)
2. As shown in the following figure, a uniform shaft of diameter d , length L , and shear modulus G , is subjected to a uniformly distributed torque t over three fourths of its length. (a) Determine an expression for the maximum shear stress in the shaft and indicate the location(s) where the maximum shear stress occurs. (b) Determine the angle of rotation at A and the angle of rotation at B . (25%)



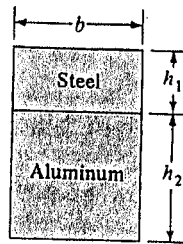
3. As shown in the following figure, a block is subjected to a confining pressure of $p = 100 \text{ MPa}$ on all sides, along with a shear stress τ_{xy} . (a) If the maximum allowable shear stress against yielding for this block is 150 MPa, what is the largest value of τ_{xy} that can be applied with a safety factor of 2? (b) Is there a large effect of the pressure p on the τ_{xy} required to cause yielding? Briefly discuss the effect of p as to whether the effect is large, small, or absent, and explain why. (15%)



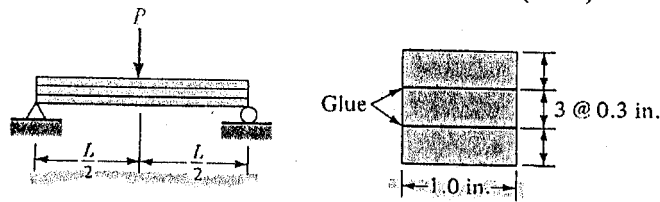
注意：背面有試題

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4. A composite beam is formed by securely bonding the steel and aluminum bars shown. If the allowable stresses in the aluminum and steel are 100 MPa and 170 MPa, respectively, determine the maximum allowable moment about a horizontal axis. Take $E_{st} = 200$ GPa, $E_{al} = 70$ GPa, $b = 25$ mm, $h_1 = 15$ mm, and $h_2 = 30$ mm. (15%)



5. The simply supported beam of the following figure is to be formed by gluing three pieces of plastic as shown. If the allowable shear stress that the glue can transmit is 135 psi, what is the allowable value of P ? (10%)



6. Determine the reactions as a result of the settling of the simple support by an amount Δ as shown. (25%)

