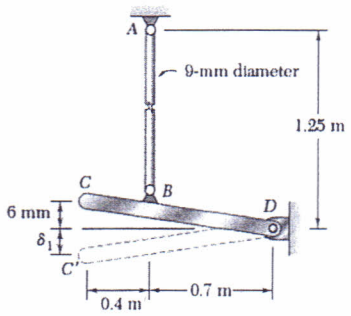
Mansoura University		Academic Year 2018/2019
Faculty of Engineering		Course Name: Stress Analysis (PDE281)
Total Grade: 50 marks		Level:(200) Dept.: BME
No. of pages: 1	1st Semester Final Exam	Time Allowed: 120 min.

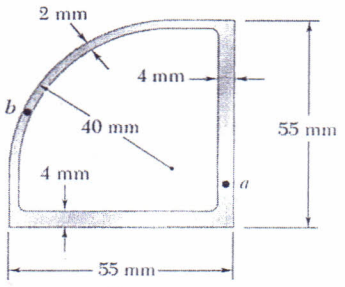
Problem 1. **(10 Marks)**

Rod AB is made of a mild steel that is assumed to be elastoplastic with E = 200 GPa and σ_Y = 345 MPa. After the rod has been attached to the rigid lever CD, it is found that end C is 6 mm too high. A vertical force Q is then applied at C until this point has moved to position C'. Determine the required magnitude of Q and the deflection δ_1 if the lever is to snap back to a horizontal position after Q is removed.:



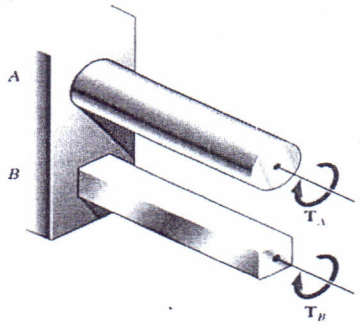
Problem 2. **(10 Marks)**

A 90-N.m torque is applied to a hollow shaft having the cross section shown. Neglecting the effect of stress concentrations, determine the shearing stress at points a and b.



Problem 3. **(10 Marks)**

Shafts *A* and *B* are made of the same material and have the same length and cross-sectional area, but *A* has a circular cross section and *B* has a square cross section. Determine the ratio of the maximum values of the angles Φ_A and Φ_B through which the two shafts A and B, respectively can be twisted.

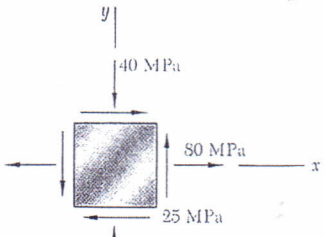


Coefficients for Rectangular Bars in Torsion

a/b	c_1	c_2
1.0	0.208	0.1406
1.2	0.219	0.1661
1.5	0.231	0.1958
2.0	0.246	0.229

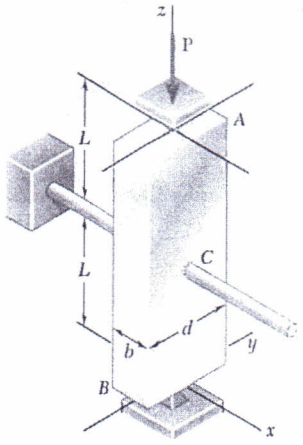
Problem 4. **(10 Marks)**

The state of plane stress shown occurs at a critical point of a steel machine component. As a result of several tensile tests, it has been found that the tensile yield strength is σ_y = 250 MPa for the grade of steel used. Determine the factor of safety with respect to yield, using (a) the maximum-shearing-stress criterion, and (b) the maximum-distortion-energy criterion



Problem 5. **(10 Marks)**

Column ABC has a uniform rectangular cross section with b = 12 mm and d = 22 mm. The column is braced in the xz plane at its midpoint C and carries a centric load P of magnitude 3.8 kN. Knowing that a factor of safety of 3.2 is required, determine the largest allowable length L. Use E = 200 GPa .



Best Wishes **Prof. Dr. Abdou Abdel-Samad**