

Mechanics of Materials  
Fall 2003

Exam 3

MENG 270  
Time allowed: 90min

Name.				Computer No.	
Q.1(a)	Q.1 (b)	Q.2	Q.3	Q.4	Total

Problem No.1 (a) [5Points]

An air vessel is 500 mm average diameter and 10 mm thickness, the length being 2 meters. Find the stresses induced in the material and change in diameter & length when charged to  $10 \text{ N/mm}^2$  internal pressure.

Take  $E = 200 \text{ kN/mm}^2$  and Poisson's ratio is 0.3

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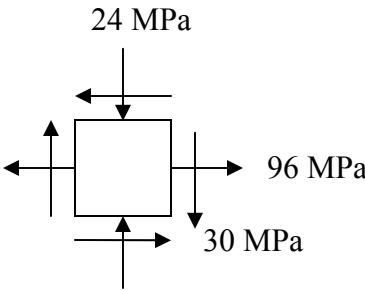
Problem No 1(b) [5 Points]

A spherical pressure vessel of 900 mm outer diameter is fabricated from steel having ultimate strength of  $\sigma_u = 400$  MPa, knowing that a factor of safety of 4 is desired and the gauge pressure can reach 3.5 MPa, determine the smallest wall thickness that should be used.

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Problem No 2 [10 Points]

The state of plane stress occurs in an aluminum member made of an alloy with tensile yield strength of 210 MPa. Determine factor of safety with respect to yield using (a) maximum shearing stress criterion (b) maximum distortion energy criterion

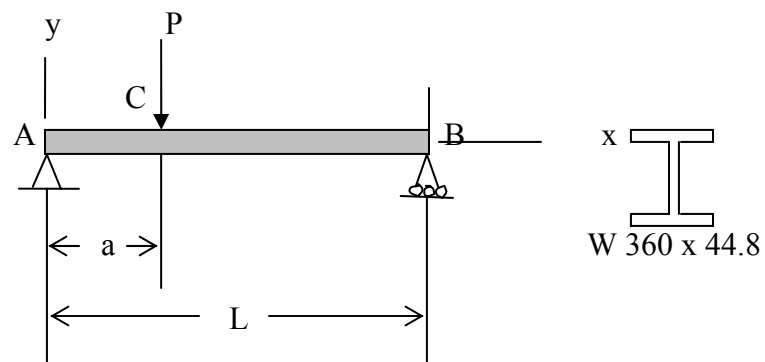


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Problem No 3 [10 Points]

Determine equation of elastic curve for the beam and loading shown in figure. Knowing that  $a=1.5$  m,  $L=5$  m and  $P=150$  kN, determine (a) the slope at support A and (b) the deflection at point C.

Take  $E = 200$  GPa.



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Problem No. 4 [10 Points]

The steel pipe AB has 102 mm outer diameter and 6 mm wall thickness. Knowing that arm CD is rigidly attached to the pipe, determine the principal stresses and maximum shearing stress at point K.

