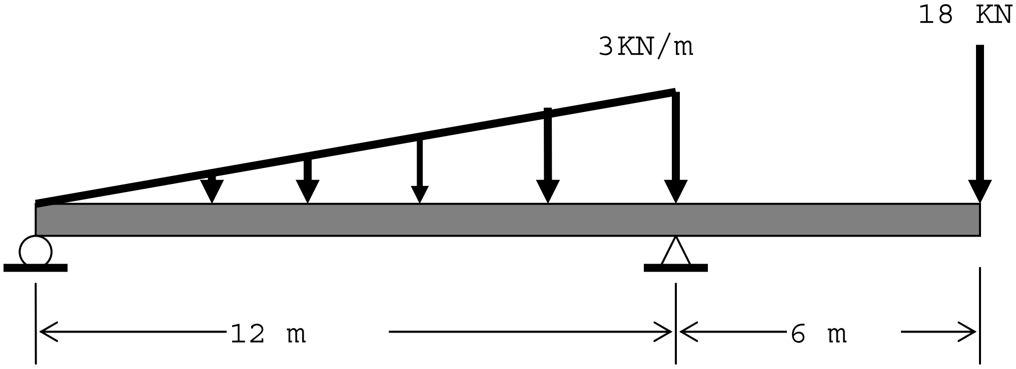
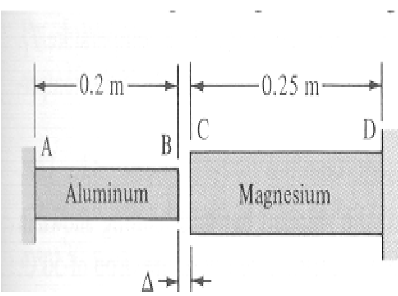
CIE202/SP05 **FINAL EXAM** **NAME______________________**

PROB-1

For the beam shown below, draw the moment and shear diagrams.

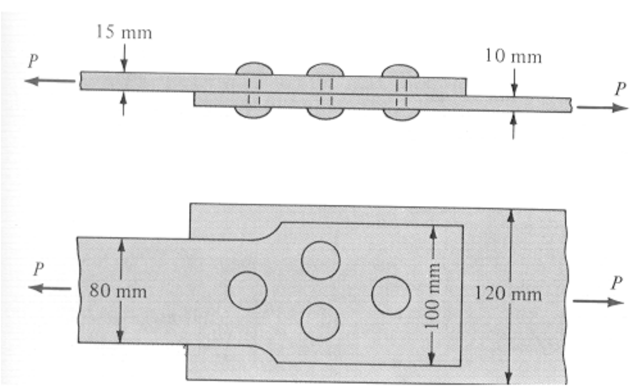


PROB-2



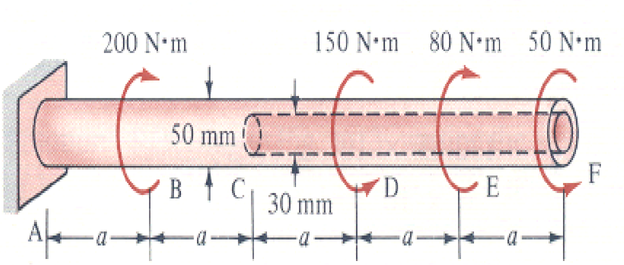
At 20°C there is a gap Δ = 0.4 mm between the ends of the aluminum and magnesium bars shown in Figure. Use E_a = 70 GPa. $\alpha_a = 23 \times 10^{-6}$/°C, A_a = 500 mm^2, E_m = 45 GPa, $\alpha_m = 26 \times 10^{-6}$/°C, and A_m = 1200 mm^2. Determine *(a)* the compressive stress in each rod when the temperature rises to 120°C and *(b)* the change in length of the magnesium bar.

PROB-3



Two plates are joined by four rivets of 20-mm diameter, as shown in Figure. Determine the maximum load *P* if the shearing, tensile, and bearing stresses are limited to 80, 100, and 140 MPa, respectively. Assume that the load is equally divided among the rivets.

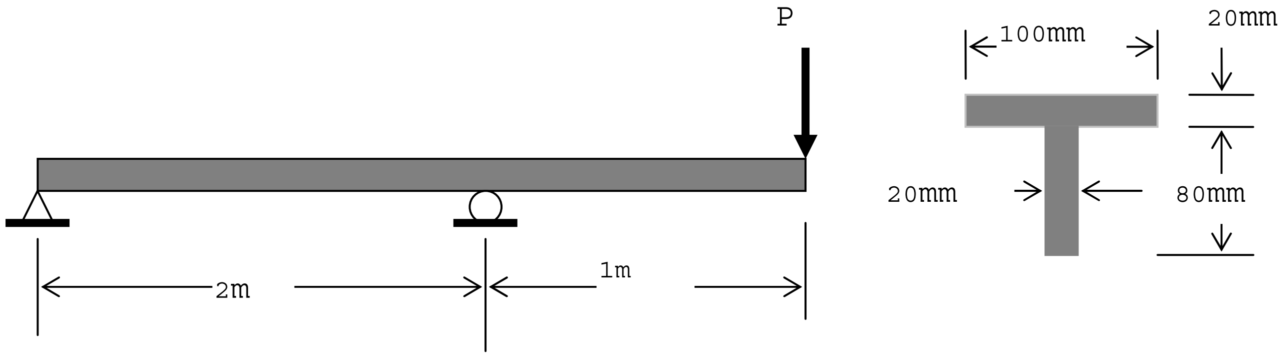
PROB-4



Determine: a) the largest shearing stress in the shaft. b) the angle of rotation in degrees at F. Given G = 80 G Pa

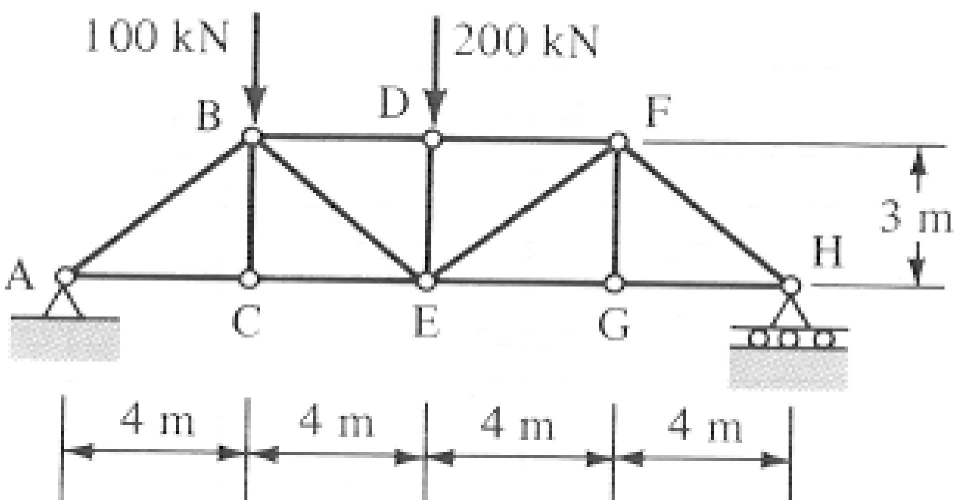
PROB-5-

Determine the value of load P so that the maximum allowable stresses does not exceed 40 M Pa in tension, 70 M Pa in compression, and 12 M Pa in shear.



PROB-6-

Determine the stress in members FE, BD, and BC of the truss shown below. Given: $A = 5000\ mm^2$.

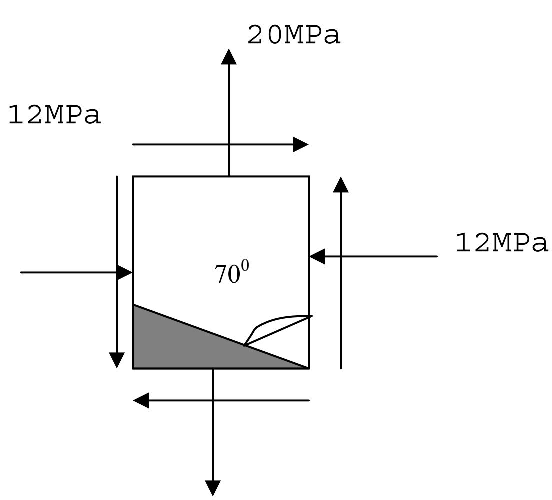


PROB-7-

A 2 inch diameter and 4 inch long solid cylinder is subjected to uniform axial stress of 7.2 Ksi. Use $E = 30\times10^3$ Ksi and $\upsilon = ⅓$. Calculate: a) the change in length, b) the change in diameter.

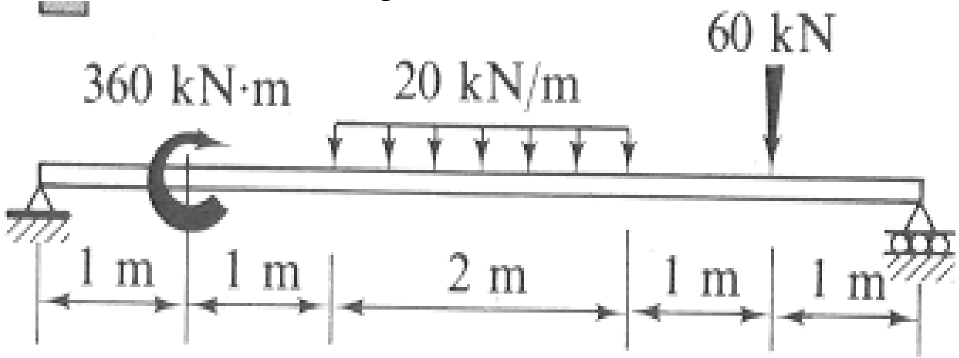
PROB-8

For the stress state shown to the left, determine the normal and shearing stresses for the shaded area using the method of equilibrium.

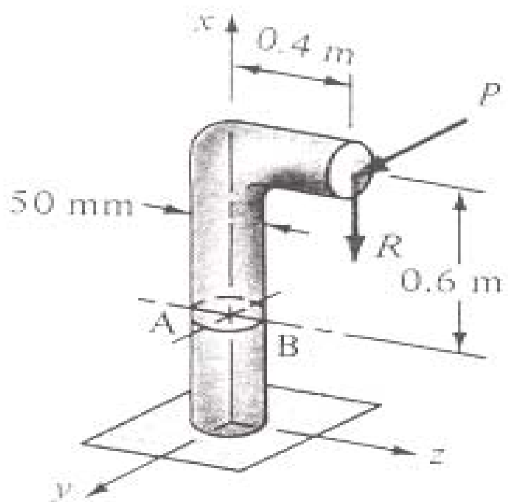


PROB-9

Draw the moment and shear diagrams for the beam shown below.



PROB-10



Loads P = 1200 N and R = 2400 N are applied at the free end of the 50 mm diameter post shown. Determine the stress state at point A and draw the stress element. Solve the problem by looking at point A from the top side

EQUATIONS:

$\varepsilon = \delta/L$; $\sigma = P/A$; $\sigma = E\varepsilon$; $\delta = \Sigma\,(P_iL_i)/(A_iE_i)$; $\tau = (VQ)/(It)$; $\bar{y} = \frac{4R}{3\pi}$; $I = \frac{\pi R^4}{4}$;

$q = (VQ)/I$; $\sigma = -(My)/I$; $Fn = qs$; $\tau = (Tr)/J$; $A = bh$; $A = bh/2$; $A = \pi R^2$;

$I = bh^3/12$; $J = \pi/2\,(R_o^4 - R_i^4)$; $I = \pi/4\,(R_o^4 - R_i^4)$; $\varepsilon = \alpha\,\Delta T$; $Q = \Sigma\,A_i\,d_i$;

$d_i = |y_i - y_c|$; $y_c = (\Sigma\,A_i\,y_i)/(\Sigma\,A_i)$; $\phi = \Sigma\,(T_iL_i)/(J_iG_i)$;

$I_c = \Sigma\,(\,I_{oi} + A_i\,d_i^2\,)$; $dV/dx = -w(x)$; $dM/dx = V$; $d^2y/dx^2 = M/EI$