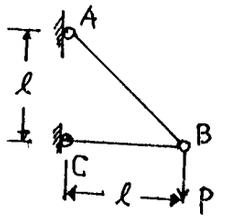
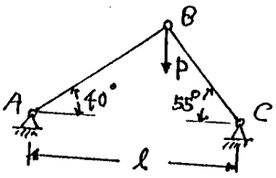
1. The truss ABC shown in the figure supports a vertical load P at joint B. Both bars have axial rigidity EA. Obtain the vertical displacement δ_b at B. by Energy method. (20%).



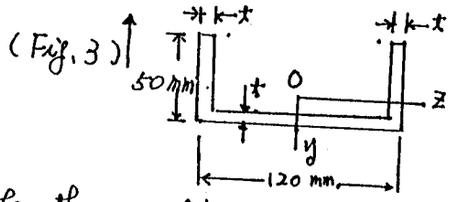
(Fig 1)

2. The truss ABC shown in the figure supports a vertical load P. Each member is a slender circular steel pipe ($E = 200$ GPa) with outside diameter 100 mm. and wall thickness 6.0 mm. Determine the allowable load Pa if the factor of safty with respect to buckling of the members is $n = 2$ and the distance between supports is $l = 7.0$ m. (20%)

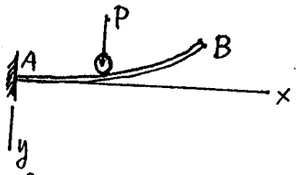


(Fig 2)

3. A beam having a cross section in the form of a channel (see figure) is subjected to a bending moment acting about the z axis. Calculate the thickness t of the channel in order that the bending stresses at the top and bottom of the beam will be in the ratio 7 : 3, respectively. (20%)



(Fig. 3)



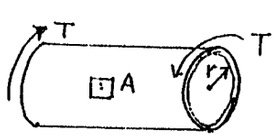
(Fig 4)

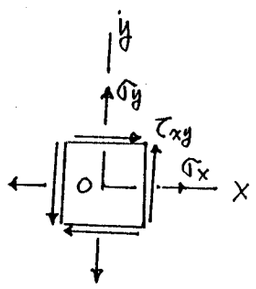
4. What must be the equation $y = f(x)$ of the axis of the curve beam AB (see figure) before the load is applied in order that the load P, moving along the bar, always stays at the same level? (20%)

5. A cylindrical pressure vessel having radius $r = 300$ mm. and wall thickness $t = 15$ mm is subjected to internal pressure $p = 2.5$ MPa. In addition, a torque $T = 120$ kN-m is applied to the closed ends of the cylinder (see figure).

(a). Determine the stresses $\sigma_x, \sigma_y, \tau_{xy}$ acting on a stress element at point A in the wall of the cylinder (10%)

(b). Determine the maximum tensile stress σ_{max} and the maximum in-plane shear stress τ_{max} in the wall of the cylinder (10%)





(Fig 5)