1. **Locate the center of gravity of the element shown in Fig. 1. Both holes are of 25 mm diameter. (20 %)**
2. **A clamp is used to hold two pieces of wood together as shown in Fig. 2. The clamp has a double square thread of mean diameter equal to 10 mm and with a pitch of 2 mm. The coefficient of friction between threads is μ_s= 0.30. If a maximum torque of 40 N-m is applied in tightening the clamp, determine (a) the force exerted on the pieces of wood, (b) the torque required to loosen the clamp. (20 %)**
3. **At a point on the surface of a pressurized cylinder, the material is subjected to biaxial stress σ_x = 90 Mpa and σ_y = 20 MPa, as shown on the stress element of Fig. 3. Using Mohr's circle, determine the stresses acting on an element inclined at an angle θ= 30°. Consider only the in-plane stresses, and show the results on a sketch of a properly oriented element. (20 %)**
4. **Determine the vertical displacement δ_B of joint B of the truss shown in Fig. 4. Note that the only load acting on the truss is a vertical load P at joint B. Assume that both members of the truss have the same axial rigidity EA. (20 %)**
5. **A simple beam with an overhang supports a uniform load of intensity q on span AB and a concentrated load P at end C of the overhang (Fig. 5). Determine the deflection δ_C and angle of rotation θc at point C. (20 %).**

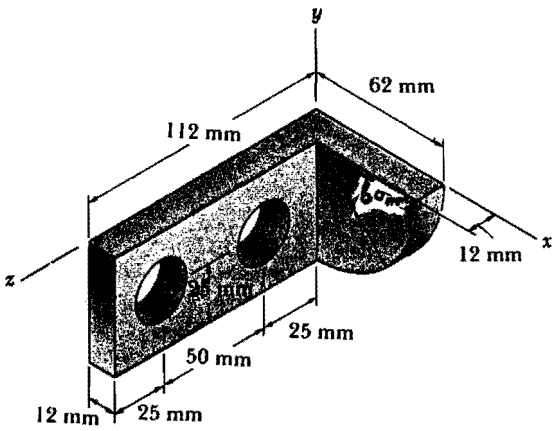

Fig. 1

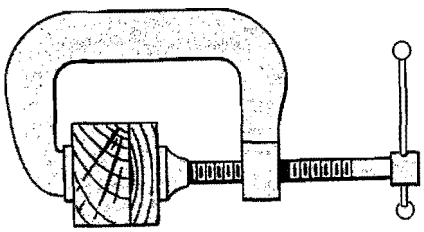
Fig. 2

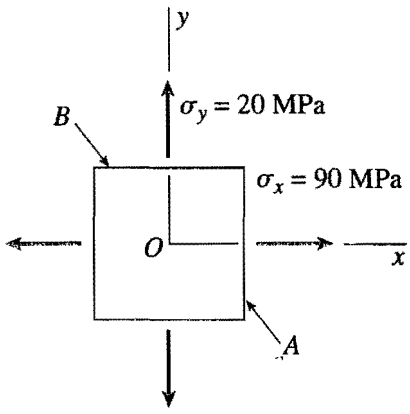

Fig. 3

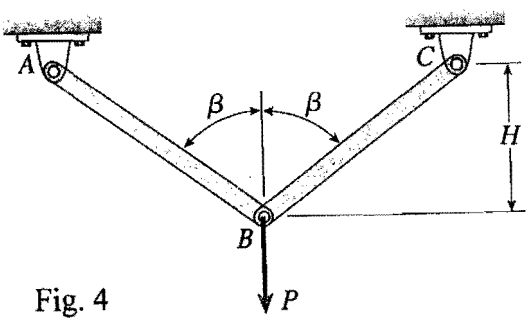

Fig. 4

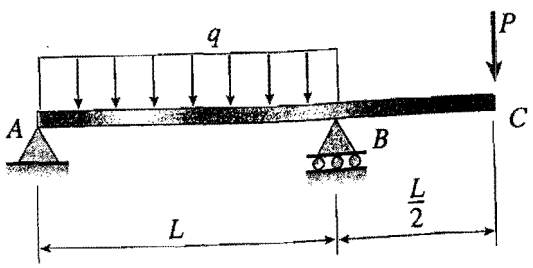

Fig.5