Sheet (1)
Stress Analysis

1) For the shown machine member 2 cm diameter and 50 cm long and supported at one end as cantilever

Find :

a) the tension stress in the member
b) If the force (F) was in the opposite direction will the stress be changed, why?

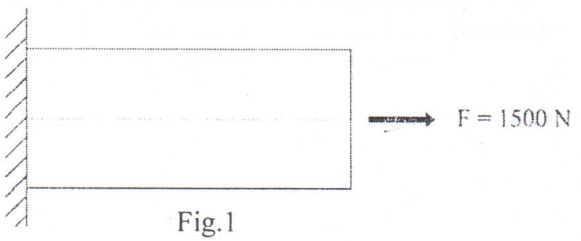


Fig.1

2) For the 10 mm diameter beams shown in fig.(2 , 3) draw the bending moment diagram and calculate the maximum bending stress in the members.

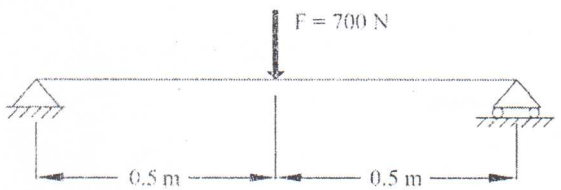


Fig.2

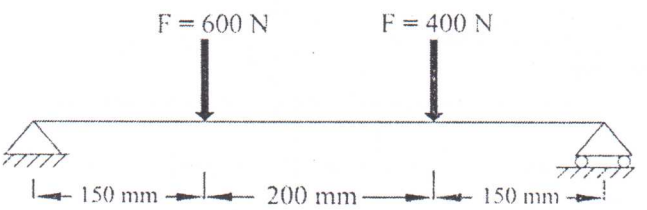
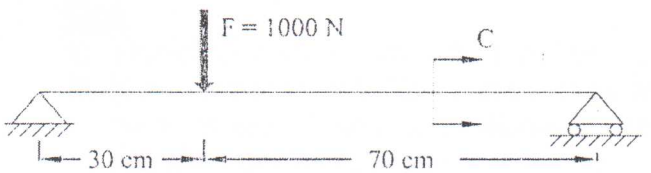
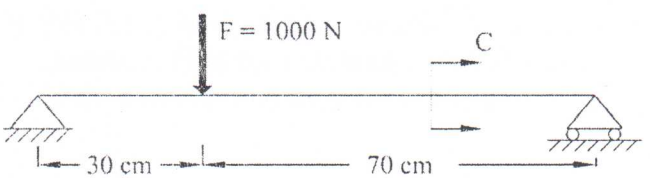


Fig.3

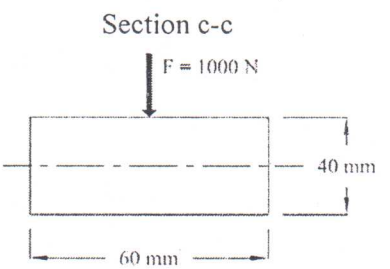
3) For the beams shown in figure 4 calculate the maximum bending stress

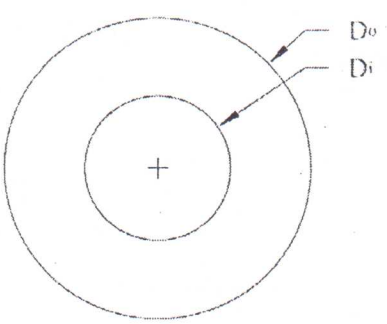


Rectangular section



Hollow cylinder section

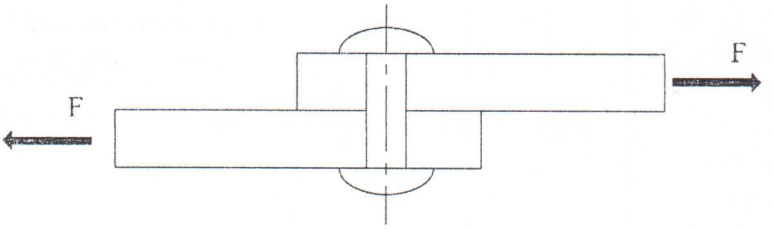




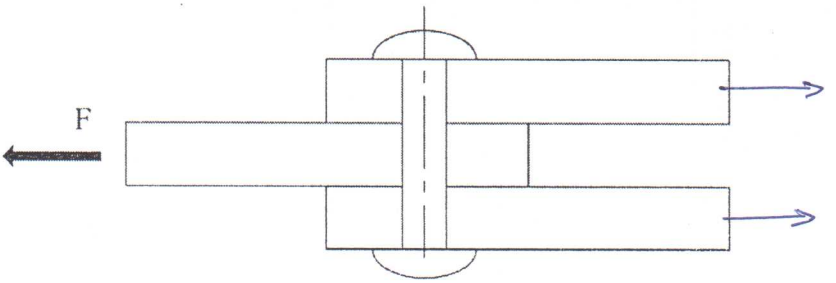
Do = 70 mm
Di = 20 mm

Fig.4

4) For the riveted joint shown in the figure the applied force F = 1500 N and the rivet diameter is 2 cm. Find the shear stress on the rivet.



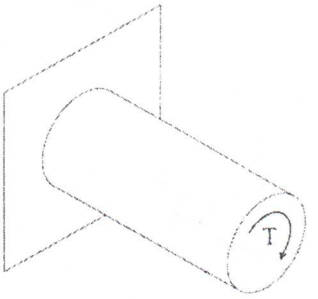
5) If we replace the previous bracket with the following with the same force (F) and rivet diameter find the shear stress on the rivet.



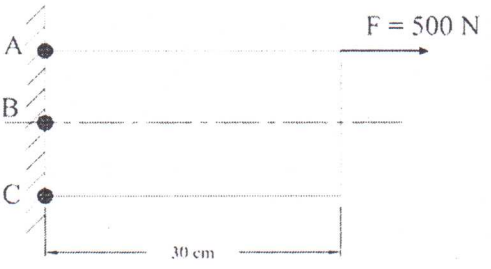
6) For the shown machine member 4 cm diameter a rotating torque T = 4 N.m acts on the member

Find

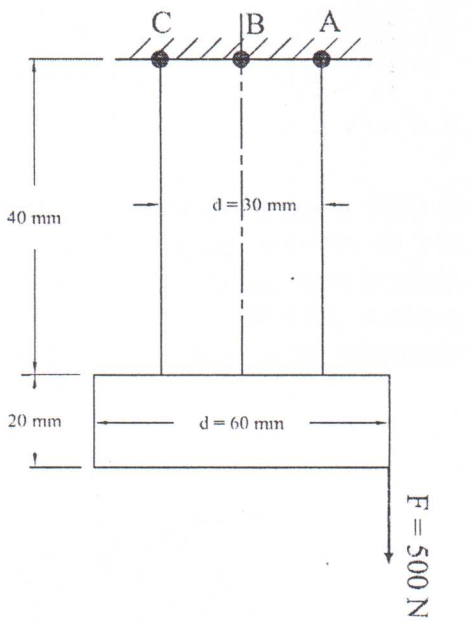
a) Maximum shear stress on the member.
b) If the member was hollow cross-section with outer diameter 4 cm & inner diameter 1 cm calculate maximum shear stress.



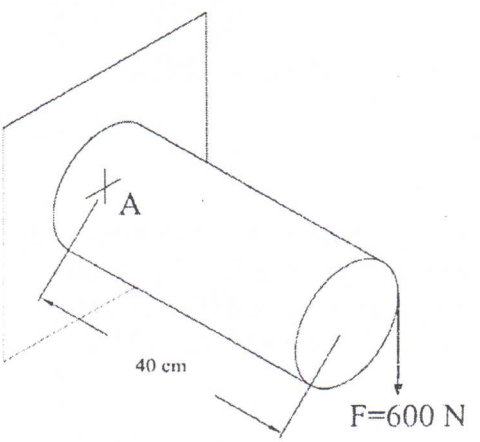
7) For the shown machine member 5 cm diameter. Find the maximum normal stress in the member and its point of action.



8) For the shown machine member find the maximum stress in the member.



9) For the shaft shown in the figure Diameter 5 cm. Find stress at point A .



Sheet (2)

Riveted Joints

1) The bracket as shown in Fig.1 is to carry a load of 45 KN. Determine the diameter of the rivet if the shear stress is not to exceed 40 MPa. Assume all rivets of the same size.

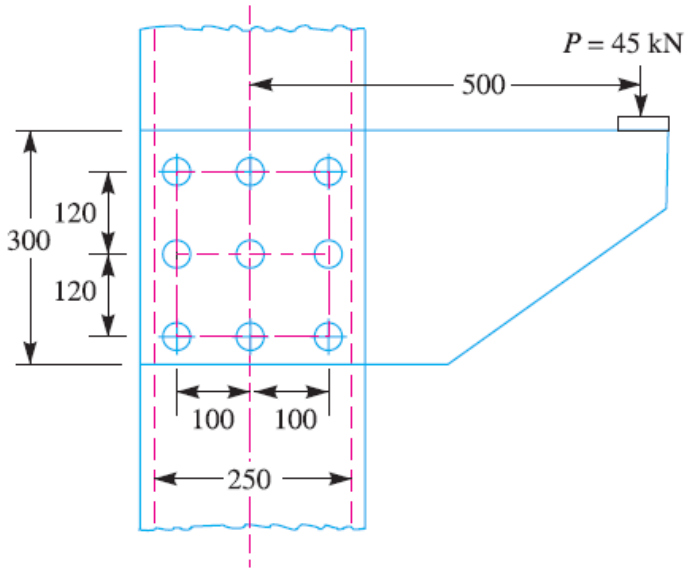


Fig.1

2) Find the value of P for the joint shown in Fig.2 based on a working stress of 100 MPa for the rivets. The four rivets are equal, each of 20 mm diameter.

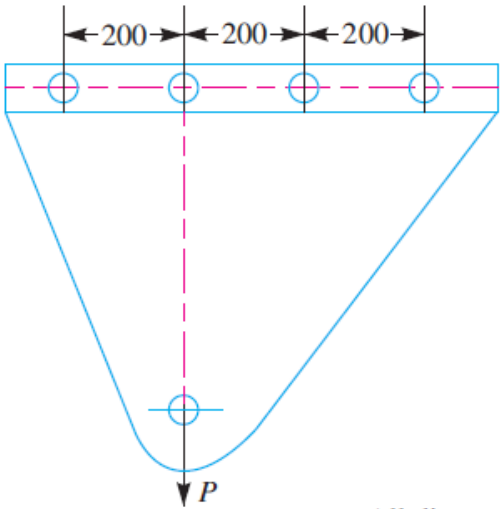


Fig.2

3) A bracket is riveted to a column by 6 rivets of equal size as shown in Fig.3. It carries a load of 60 KN at a distance of 200 mm from the center of the column. If the maximum shear stress in the rivet is limited to 150 MPa, determine the diameter of the rivet.

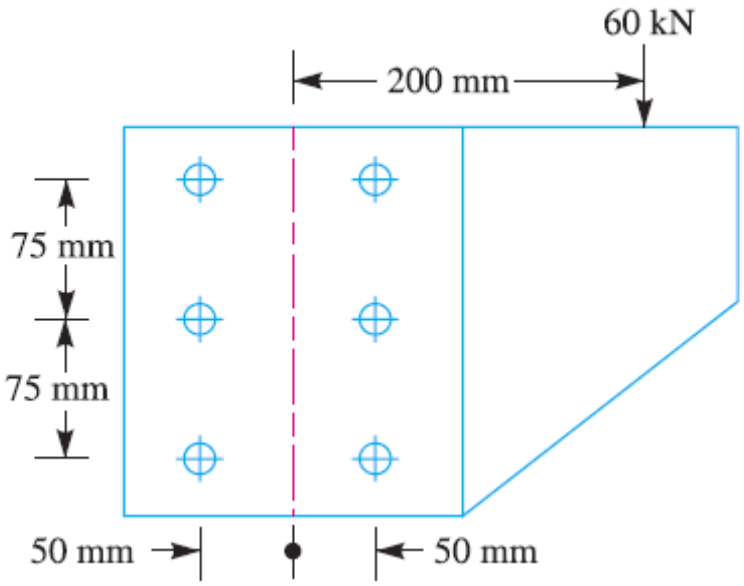


Fig.3

Sheet (3)

Welded Joints

1) A bracket, shown in Fig.1, is to carry a load of 10 KN. Find the size of the weld if the allowable shear stress is not to exceed 80 MPa.

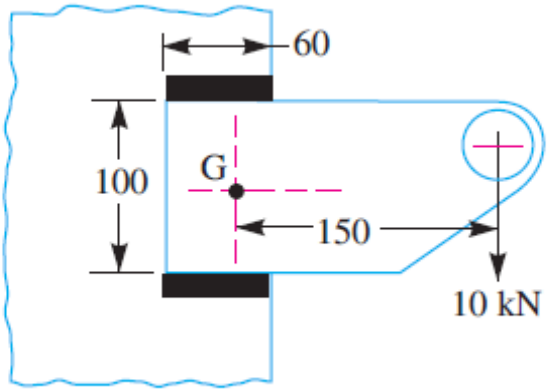


Fig.1

2) Fig.2 shows a welded joint subjected to an eccentric load of 20 KN. The welding is only on one side. Determine the uniform size of the weld on the entire length of two legs. Take permissible shear stress for the weld material as 80 MPa.

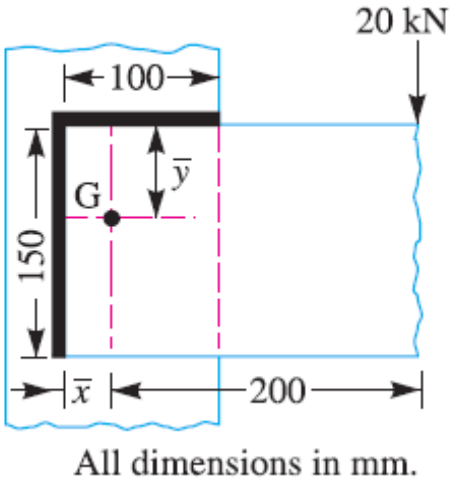


Fig.2

3) A bracket is welded to the side of a column and carries a vertical load P, as shown in Fig.3. Evaluate P so that the maximum shear stress in the 10 mm fillet welds is 80 MPA.

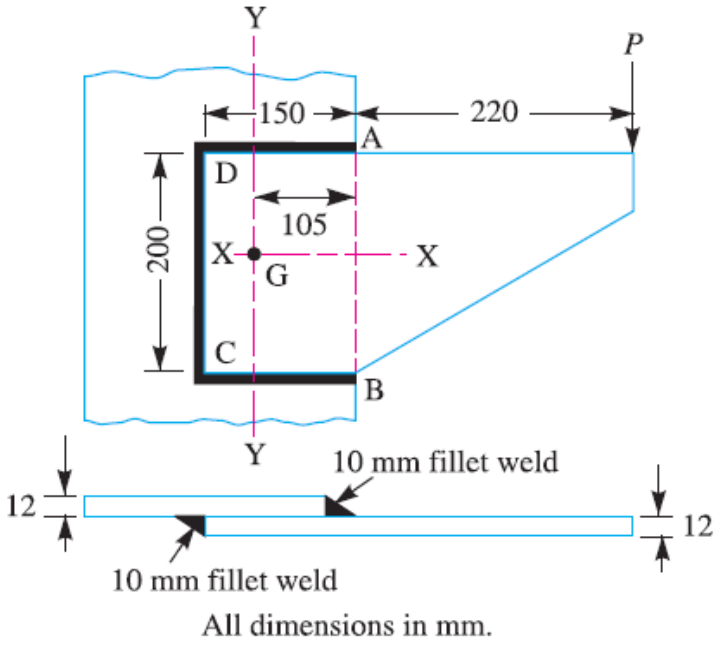


Fig.3

4) A bracket, shown in Fig.4, carries a load of 40 KN. Calculate the size of the weld if the allowable shear stress is not to exceed 80 MPa.

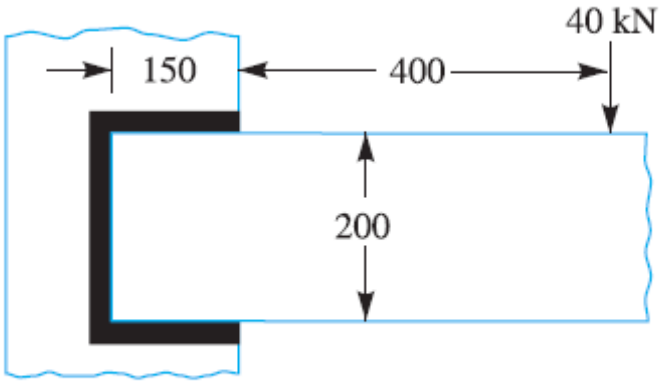


Fig.4

Sheet (4)

Belt drive

1- Find the power that can be transmitted from a 200 mm pulley to a 400 mm one. The two pulleys are 1.5 m apart. The small pulley rotates at 900 rpm and the belt is 50 x 5 mm. You may assume a coefficient of friction between the belt and pulley of 0.3 and the belt weight 11 kN/m^3. Let σ_{all} = 2 MPa for belt material.

2- Find the number of V-belt required to transmit 2 kW from a motor running with 900 rpm and has a sheave diameter of 200 mm to 400 mm sheave 1.5 m apart. Assume μ = 0.3, W = 11 kN/m^3, A = 140 mm^2, σ_{all} = 2 MPa, groove angle = 38^o, service factor is unity.

3- Find the number of 80 mm^2 V-belts required to transmit 5 kW from a 200 mm sheave running with 900 rpm to another sheave 1 m apart with a reduction ratio of 3:1. The belt weight 11 kN/m^3 and has σ_{all} = 2 MPa. You may assume μ = 0.3 and the groove angle is 38^o. The service factor is 1.2.

4- Find the maximum power and its corresponding belt speed that can be delivered by a 50 x 4 mm flat belt with a least angle of contact 2.5 rad. If the following specifications are given σ_{all} = 2 MPa, μ = 0.3, W = 10.5 kN/m^3.

5- Find the maximum power and its corresponding belt speed that can be transmitted through a V-belt drive. The drive specifications are:-

- σ_{all} = 2.5 MPa
- Belt cross-section are = 80 mm^2
- 3 belts are used
- μ = 0.3, 2β = 38^o
- Belt weight 11 kN/m^3
- Minimum angle of contact = 2.5 rad
- Motor sheave diameter is 200 mm