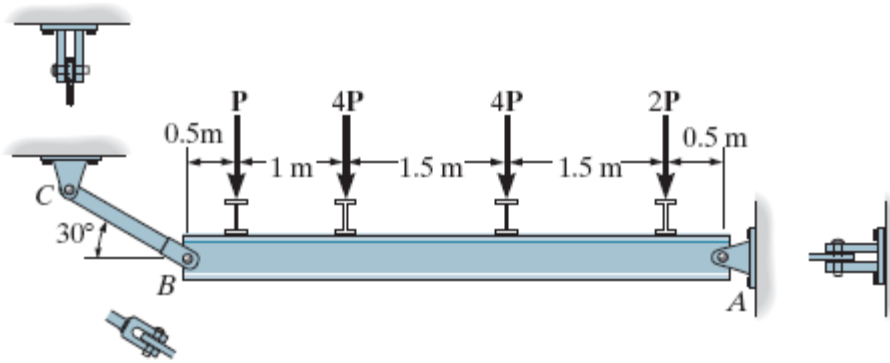


CHAPTER I- STRESS

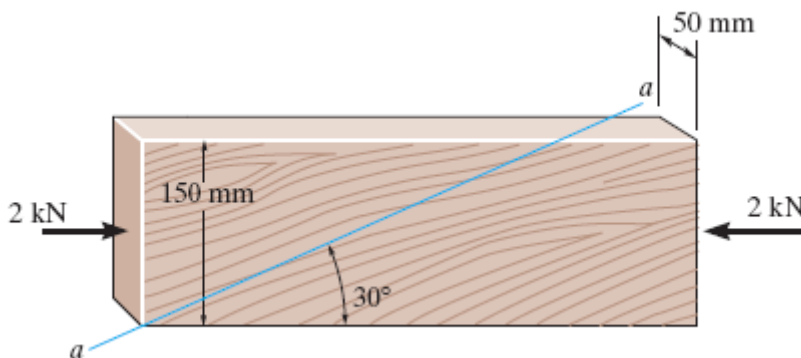
1- The beam is supported by a pin at A and a short link BC. Determine the maximum magnitude P of the loads the beam will support if the average shear stress in each pin is not to exceed 80 MPa. All pins are in double shear as shown, and each has a diameter of 18 mm.

($P = 3.70 \text{ kN}$)



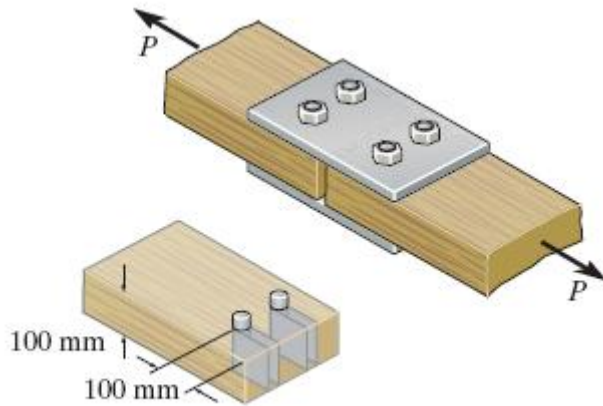
2- The block is subjected to a compressive force of 2 kN. Determine the average normal and average shear stress developed in the wood fibers that are oriented along section $a-a$ at 30° with the axis of the block.

(66.7 kPa, 115 kPa)



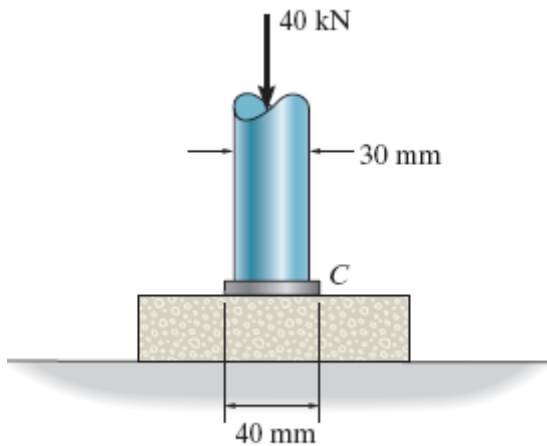
3- If the joint is subjected to an axial force of $P=9 \text{ kN}$, determine the average shear stress developed in each of the 6-mm diameter bolts between the plates and the members and along each of the four shaded shear planes.

(79.6 MPa, 225 kPa)



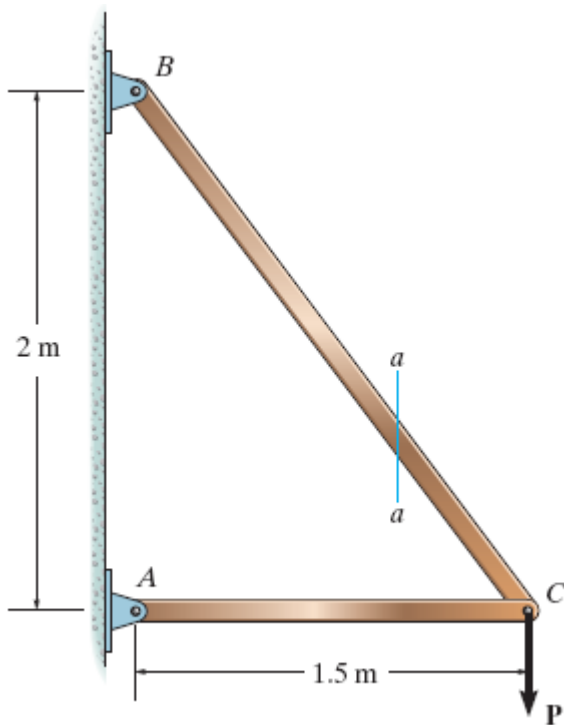
4- The shaft is subjected to the axial force of 40 kN. Determine the average bearing stress acting on the collar *C* and the normal stress in the shaft.

(56.6 MPa, 31.8 MPa)



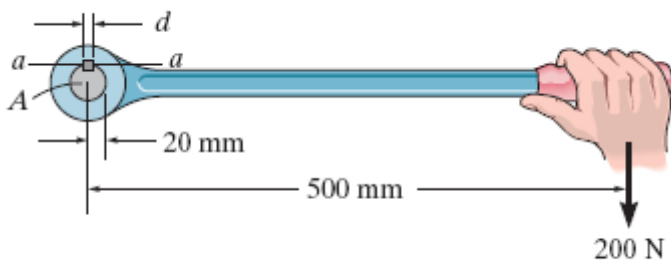
5- Determine the largest load **P** that can be applied to the frame without causing either the average normal stress or the average shear stress at section *a-a* to exceed $\sigma = 150$ MPa and $\tau = 60$ MPa, respectively. Member *CB* has a square cross section of 25 mm on each side.

(62.5 kN)



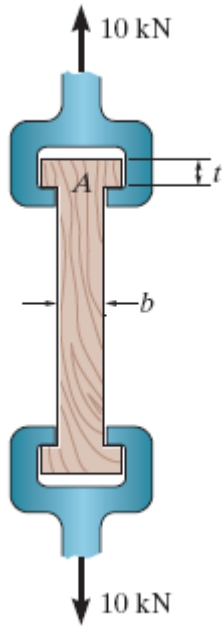
6- The lever is attached to the shaft A using a key that has a width d and length of 25 mm. If the shaft is fixed and a vertical force of 200 N is applied perpendicular to the handle, determine the dimension d if the allowable shear stress for the key is $\tau_{\text{allow}} = 35 \text{ MPa}$.

(5.71 mm)



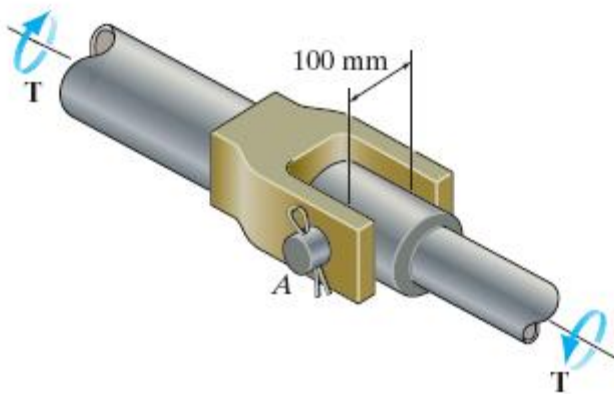
7- The wood specimen is subjected to the pull of 10 kN in a tension testing machine. If the allowable normal stress for the wood is $\sigma_{\text{all}} = 12 \text{ MPa}$ and the allowable shear stress is $\tau_{\text{all}} = 1.2 \text{ MPa}$ determine the required dimensions b and t so that the specimen reaches these stresses simultaneously. The specimen has a width of 25 mm.

(167 mm, 33,3 mm)



8- The joint is used to transmit a torque of $T=3 \text{ kN.m}$. Determine the required minimum diameter of the shear pin A if it is made from a material having a shear failure stress of $\tau_{\text{fail}}=150 \text{ MPa}$. Apply a factor of safety of 3 against failure.

(27.6 mm)



9- The frame is subjected to the load of 4 kN which acts on member ABD at D . Determine the required diameter of the pins at D and C if the allowable shear stress $\tau_{\text{all}}=40 \text{ MPa}$ for the material is Pin C is subjected to double shear, whereas pin D is subjected to single shear.

(12 mm, 14 mm)

