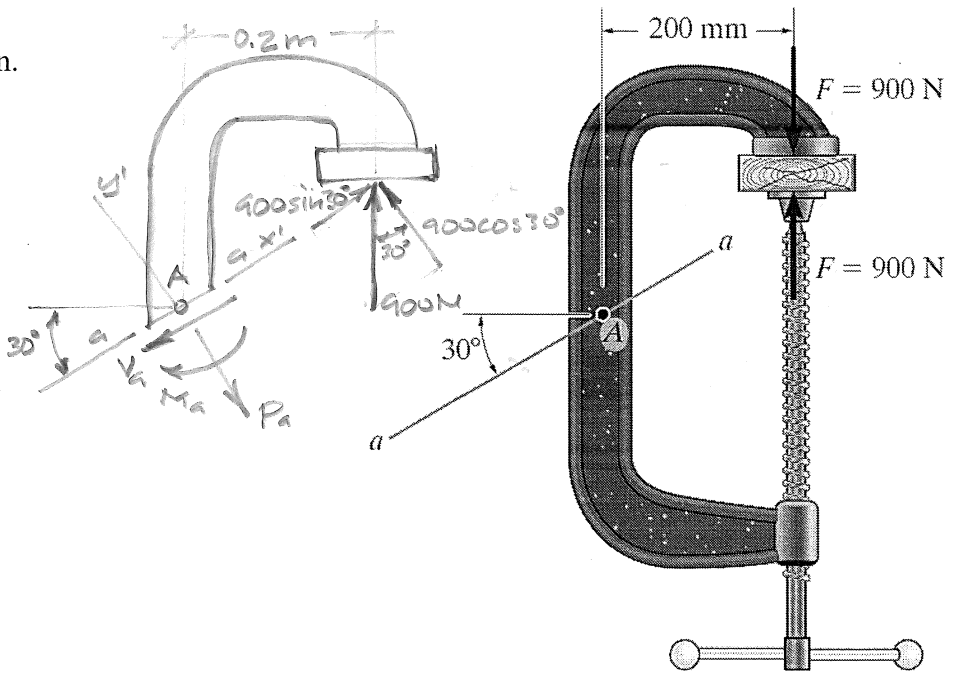
1) GIVEN: C-clamp loaded as shown.
REQ'D: Internal loads at *a-a*.



$\Sigma F_{y'} = 0$

$900\cos 30° - P_a = 0$

$P_a = 779.4\ N$ ↘

$\Sigma F_{x'} = 0$

$900 \sin 30° - V_a = 0$

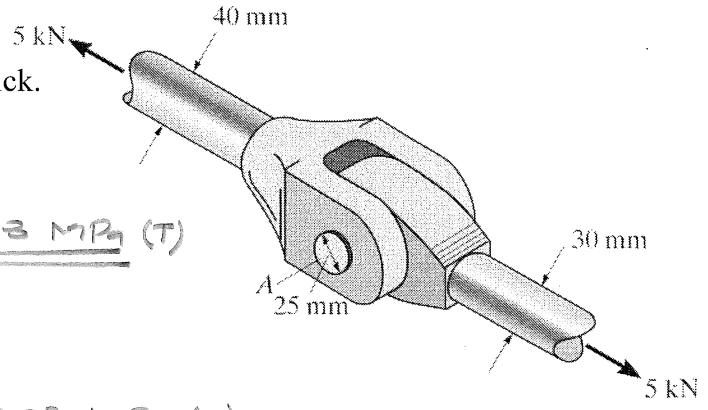
$V_a = 450.0\ N$ ↙

$\Sigma M_a = 0$

$900N(0.20\,m) - M_a = 0$ ↺

$M_a = 180\ N \cdot m$

2) GIVEN: Yoke-and-rod connection.
REQ'D: a) Average normal stress in each rod.
b) Average shear stress in pin.
c) Bearing stress if the yoke leaves are 20mm thick.



FOR Ø 40 mm ROD

$\sigma_{40} = \frac{P}{A} = \frac{5000\,N}{\frac{\pi}{4}(40mm)^2} = 3.98\ \frac{N}{mm^2} \Rightarrow$ 3.98 MPa (T)

FOR Ø 30mm ROD

$\sigma_{30} = \frac{P}{A} = \frac{5000\,N}{\frac{\pi}{4}(30mm)^2} = 7.07\ \frac{N}{mm^2} \Rightarrow$ 7.07 MPa (T)

SHEAR IN PIN

$\tau_{AVG} = \frac{P}{A_S} = \frac{5000\,N}{\frac{\pi}{4}(25mm)^2 \times 1 \times 2} = 5.09\ \frac{N}{mm^2} \Rightarrow$ 5.09 MPa

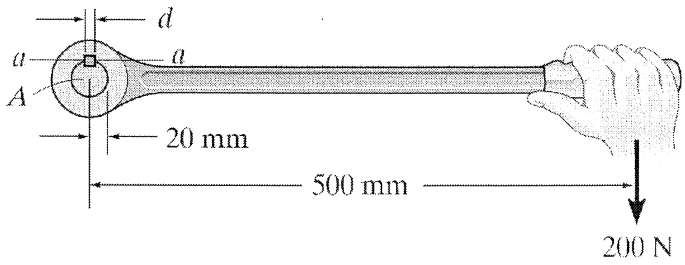
ONE PIN; DOUBLE SHEAR

BEARING STRESS

$\sigma_y = \frac{F}{A_b} = \frac{5000\,N}{(25mm)(20mm)(2)} = 5.0\ \frac{N}{mm^2} \Rightarrow$ 5.0 MPa

TWO LEAVES IN YOKE

3) GIVEN: Lever attached to shaft A with 25mm long key.
REQ'D: Key dimension d if $\tau_{allow} = 35$ MPa.



$\Sigma M_A = 0$

$F_A(20mm) - 200N(500mm) = 0$

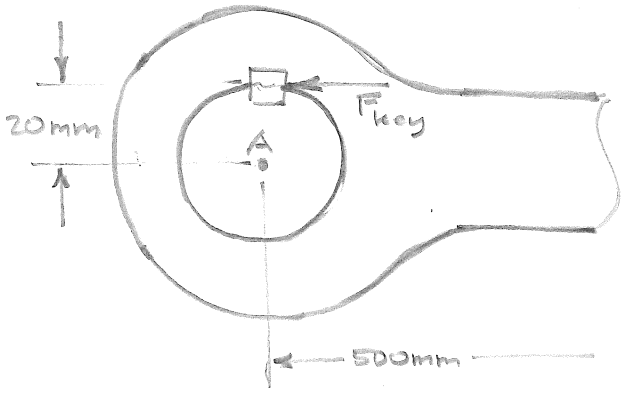
$F_{key} = 5000\ N$

$\tau_{allow} = \frac{F}{A_s} \Rightarrow A_s = \frac{F}{\tau_{allow}}$

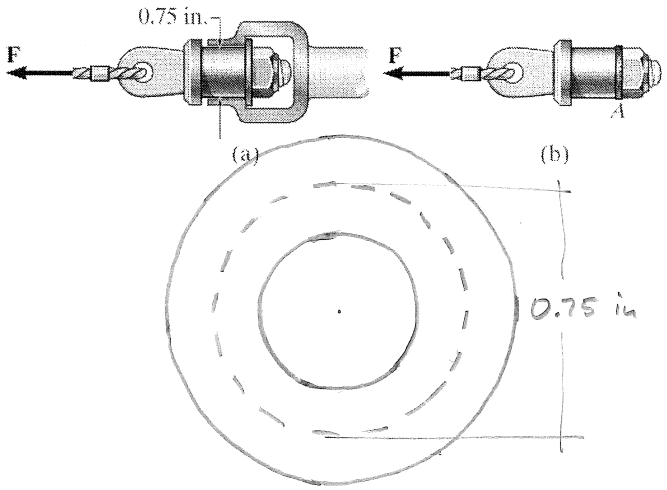
$A_s = \frac{5000\ N}{35\ MPa} = 142.86\ mm^2$

$A_s = L_{key}(d) \Rightarrow d_{REQ'D} = \frac{A_s}{L_{key}}$

$d_{REQ'D} = \frac{142.86\ mm^2}{25mm} = \underline{\underline{5.71\ mm}}$



4) GIVEN: Rope swivel constructed as shown. F = 500 lb
REQ'D: Shear stress in washer if it is 1/16 in thick.



$\tau_{AVG} = \frac{V}{A_s}$

$A_s = (\text{SHEARED PERIMETER}) \times \text{THICKNESS}$

$= \pi(.75\ in)(1/16\ in)$

$= 0.147\ in^2$

$\tau_{AVG} = \frac{500\ lb}{0.147\ in^2} = \underline{\underline{3395\ psi}}$