

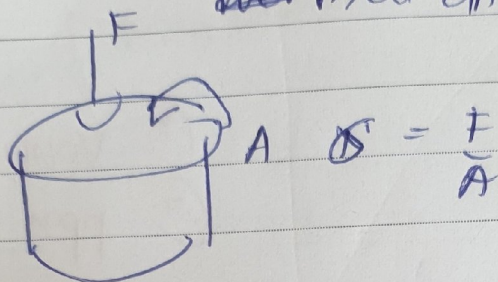
Solution
filed

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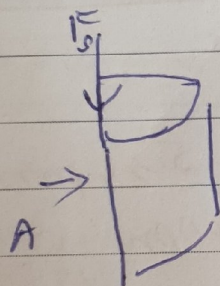
MCTA 2332

Question 2.

a) i) Normal stress \rightarrow force over normal area of the normal/perpendicular surface.

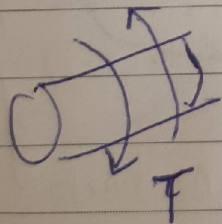


ii) shear stress - force over area of parallel surface.



$$\tau = \frac{F_0}{A}$$

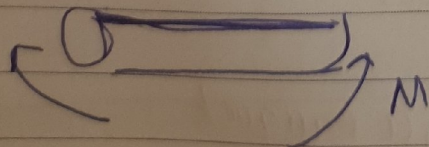
iii) torsion - torque $\times c$ - stress



$$\tau = \frac{Tc}{J}$$

when an object is twisted

iv) Bending stress - stress on an object when it is bent.

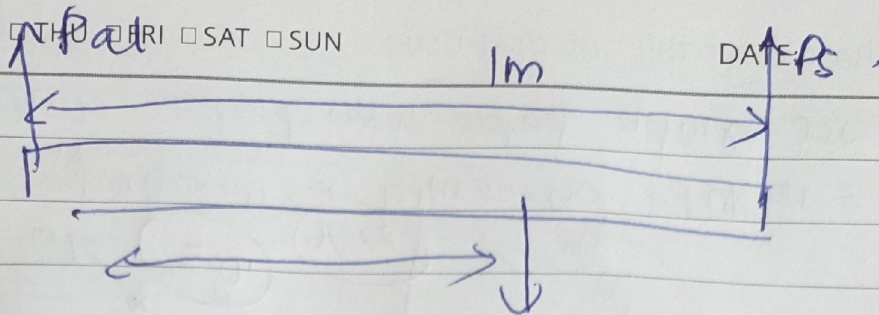


$$\sigma = \frac{Mc}{I}$$

v) strength - the amount of stress that object can support.



b).



i) $\sum F_y = 0$,

$0.6m$ $70kN$

$$F_a + F_b - 70 \times 9.8 = 0$$

$$F_a + F_b = 70 \times 9.8$$

ii) $\sum M_a = 0$ $-F_b (1) + 0.6 (70 \times 9.8) = 0$

$$F_b = 0.6 (70 \times 9.8) = 411.6N$$

$$F_a = 70 \times 9.8 - 411.6N = 274.4N$$

$$\sigma_s = \frac{411.6}{\pi (0.5 \times 10^{-3})^2}$$

$$= 327.5 kPa$$

$$\sigma_a = \frac{274.4}{\pi (0.5 \times 10^{-3})^2}$$

$$= 139.75 kPa$$

ii)

* correction ketukin pin A, pin B kt dlm

pin diameter

$$\tau_A = \frac{F_a}{\pi r^2}$$

$$= \frac{274.4}{\pi (0.5 \times 10^{-3})^2}$$

$$= 349.4 MPa$$

$$\tau_B = \frac{F_b}{\pi r^2}$$

$$= \frac{411.6}{\pi (0.5 \times 10^{-3})^2}$$

$$= 624.1 MPa$$

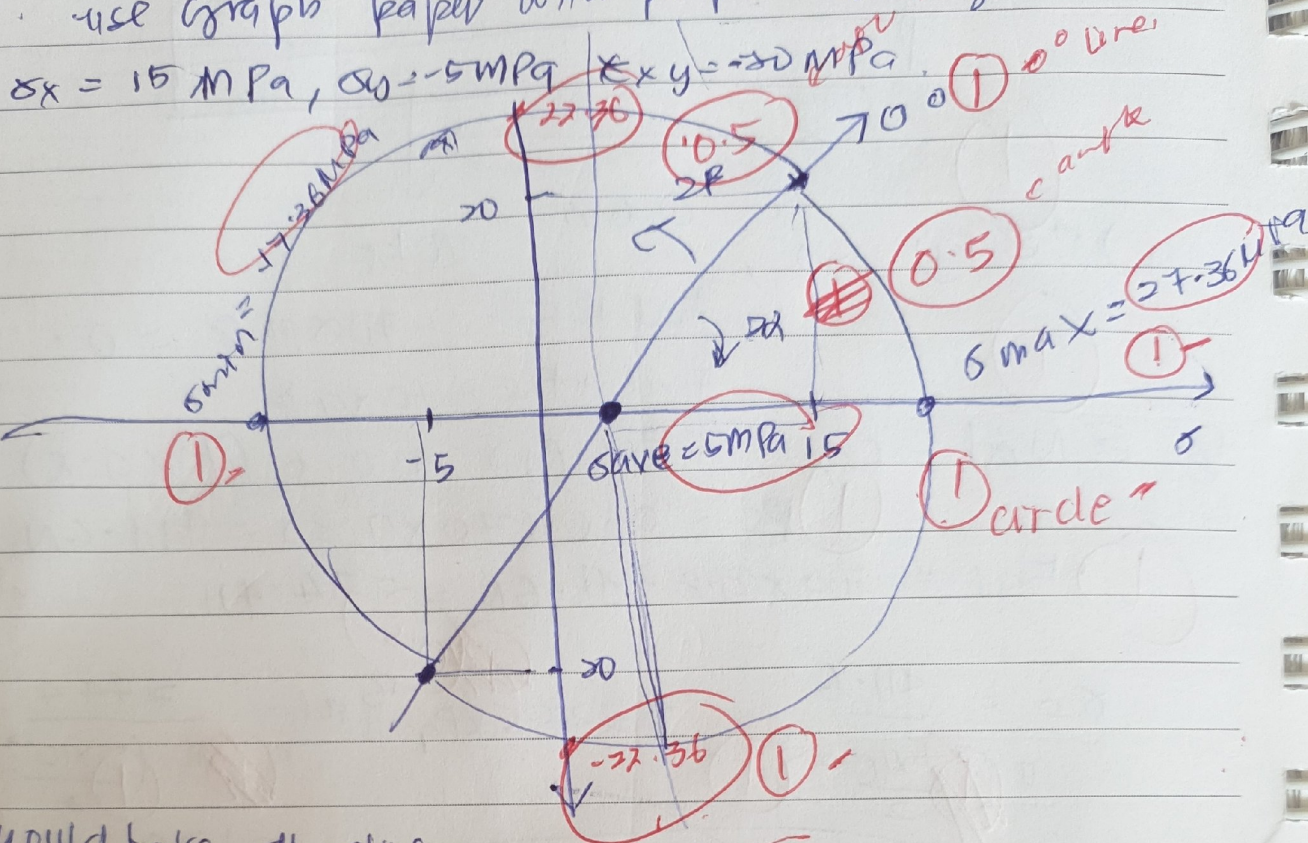


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Q2) use graph paper with proper scaling.



should take all values

$\sigma_{avg} = 5$ from graph

$\sigma_{avg} = 5 \text{ MPa}$

~~max~~ ~~min~~

$(\sigma_x, \tau_{xy}) = (15, -20)$

$$r = \sqrt{\left(\frac{\sigma_x - \sigma_y}{2}\right)^2 + (\tau_{xy})^2}$$

$$= \sqrt{\left(\frac{15 - (-5)}{2}\right)^2 + (-20)^2}$$

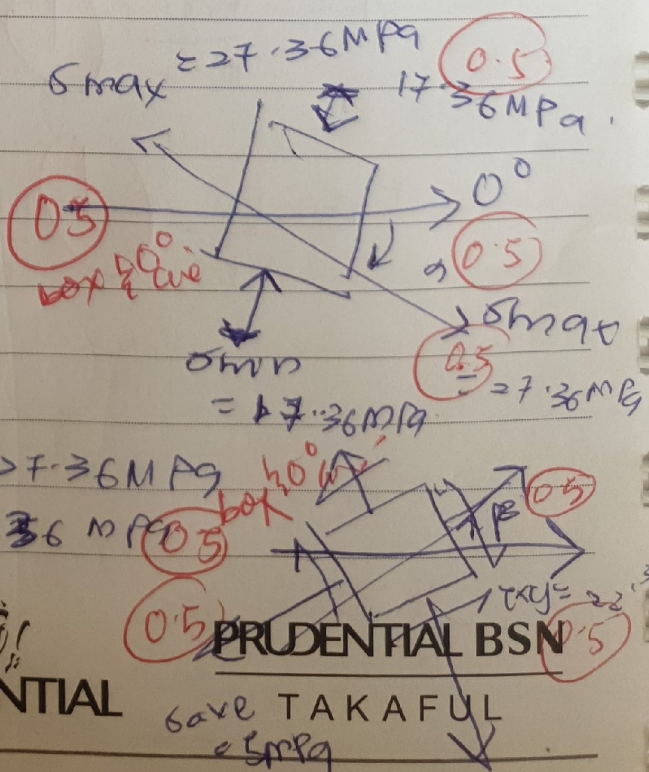
$= \sqrt{10^2 + 20^2}$

$= 22.36 \text{ MPa}$

$\sigma_{max} = 5 + 22.36 = 27.36 \text{ MPa}$

$\sigma_{min} = 5 - 22.36 = -17.36 \text{ MPa}$

$\tau_{xy \text{ max CCW}} = 20 \text{ MPa}$
 $\tau_{xy \text{ max CW}} = 20 \text{ MPa}$



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save TAKAFUL

Q2d)

$F = 20\text{ N}$ $r = 2\text{ cm}$ $w = 8\text{ cm}$

at the notch

FT8A - 15.3

$\frac{r}{d} = \frac{2}{14} = 0.143$

$\frac{w}{d} = \frac{18}{14} = 1.286$

$k_t \approx 2.1$

$\sigma = 2.1 \left(\frac{20}{14 \times 10^{-2} \times 3 \times 10^{-2}} \right) = 1 \times 10^4 \text{ Pa}$

at the hole,

FT8A - 15.1

$\frac{d}{w} = \frac{4}{18} = 0.222$

$k_t \approx 2.5$

$\sigma = 2.5 \left(\frac{20}{14 \times 10^{-2} \times 3 \times 10^{-2}} \right) = 1.1 \times 10^4 \text{ Pa}$



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