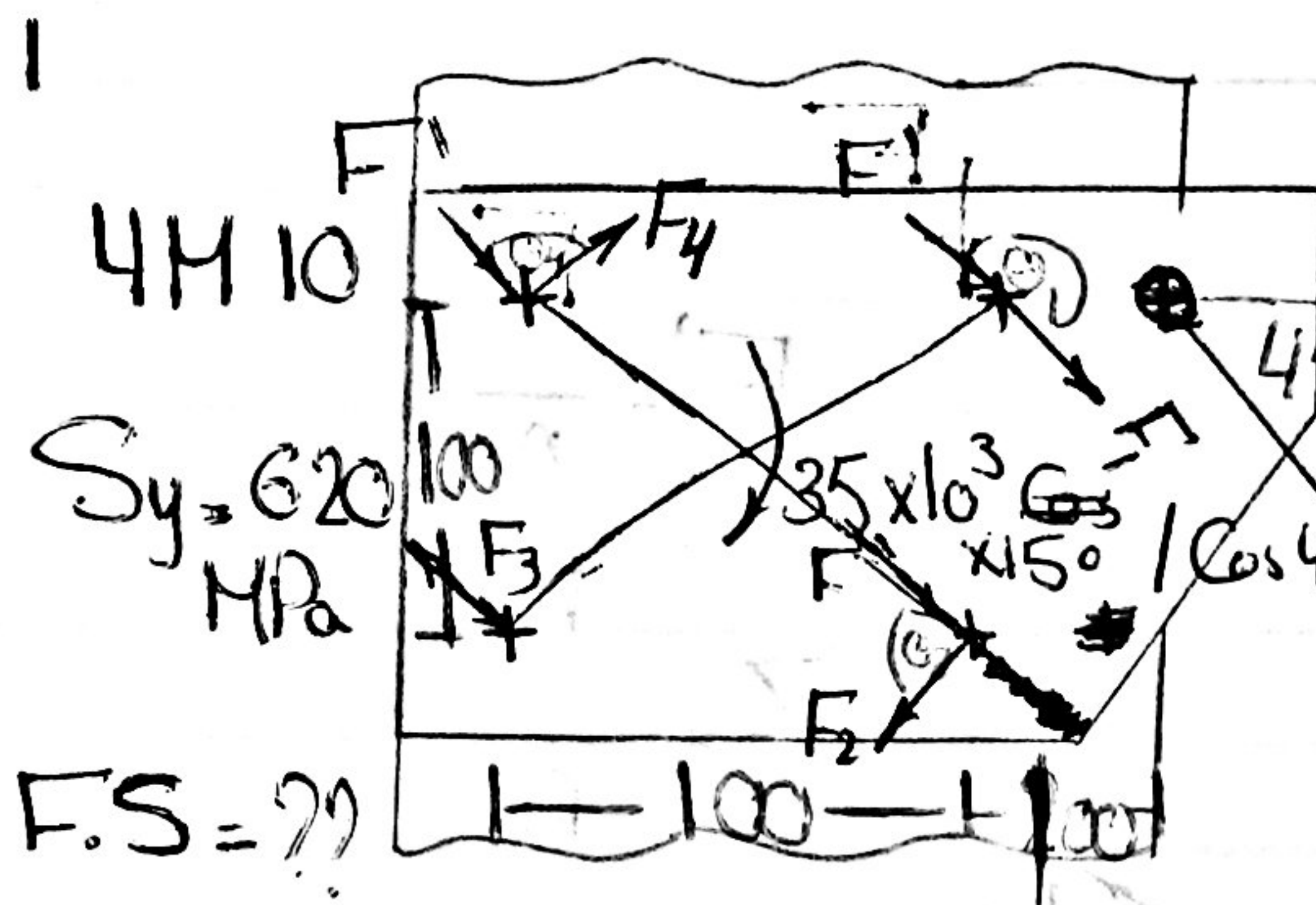


Sheet Two



بفضل ال Force زي ما هي نفس الاتجاه وتقسم على عدد اكساير ونحسب ال Shear

ال Moment بتزل ال Force خارجة من Bolt

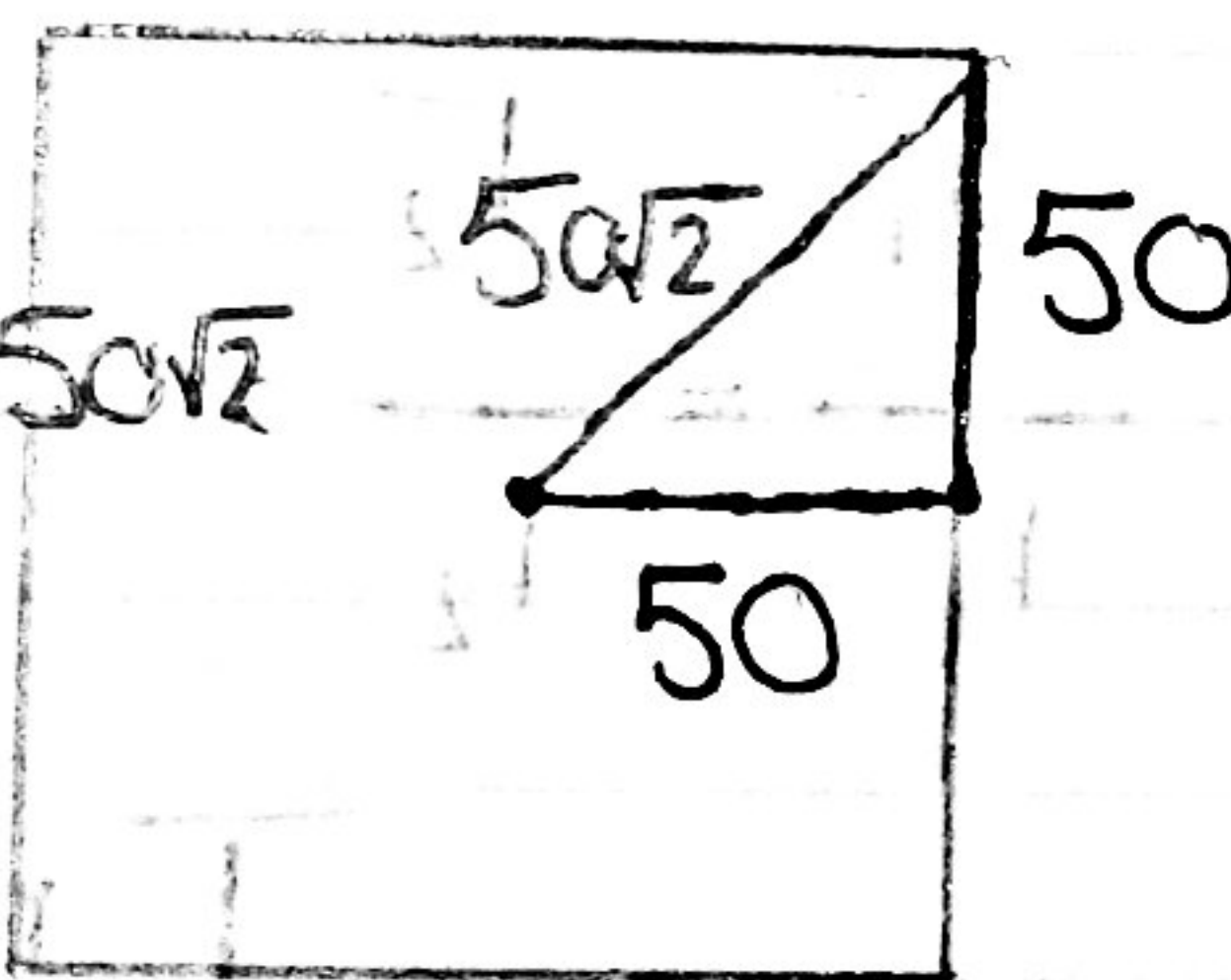
Solution.

$$F' = \frac{F}{n} = \frac{35 \times 10^3}{4} = 8750 \text{ N}$$

$$FL = F_1 r_1 + F_2 r_2 + F_3 r_3 + F_4 r_4$$

$$F_m = \frac{\sum r_m}{\sum r_i^2}$$

$$r_1 = r_2 = r_3 = r_4 = 50\sqrt{2}$$



Max Stress Bolt "max r, max θ "

$$F_1 = \frac{35 \times 10^3 \times 150 \times 45 \times 50\sqrt{2}}{4 (50\sqrt{2})^2}$$

$$= 26250 \text{ N} \tan 45 = \frac{\text{opp.}}{\text{adj.}}, \text{ opp} = 450 \text{ mm}$$

$$\cos 45 = \frac{\text{adj.}}{\text{hyp.}}, \sin 45 = \frac{\text{opp.}}{\text{hyp.}}$$

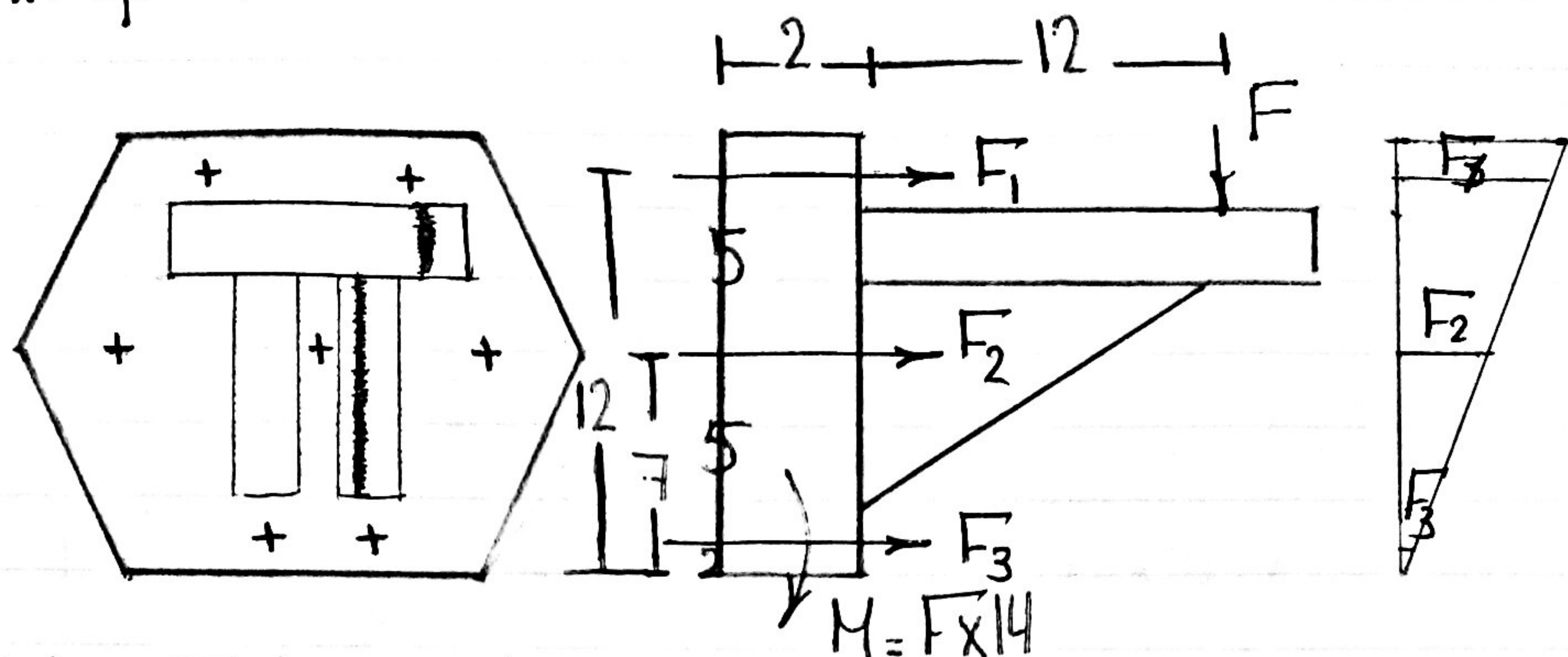
$$\begin{aligned}
 F_S &= \sqrt{F_1^2 + F_1^2 - 2F_1 F_1 \cos \theta} \rightarrow 180^\circ \\
 &= \sqrt{F_1^2 + F_1^2 + 2F_1 F_1} = \sqrt{(F_1 + F_1)^2} = F_1 + F_1 \\
 &= \frac{35000}{n} + F_1 = \frac{35000}{4} + 18561.55301 \\
 &= 27311.55301 \text{ N}
 \end{aligned}$$

$$\tau = \frac{F_S = 27311.55}{\frac{\pi}{4}(0.85 \times 10)^2 \times 1} = \frac{0.5 \text{ Sy}}{\text{F.O.S}}$$

$$481.303 \text{ F.O.S} = 0.5 \times 620 \times 10^6$$

$$\text{F.O.S} = 0.6440847709 \times 10^6$$

Example.



$$M_o = F \cdot L = 2F_1L_1 + 3F_2L_2 + 2F_3L_3$$

$$14F = 2 \times 12F_1 + 3 \times 7F_2 + 2 \times 2F_3 \rightarrow 1$$

From Triangle Similarity

$$\frac{F_1}{L_1=12} = \frac{F_2}{L_2=7} = \frac{F_3}{L_3=2}$$

$$F_2 = \frac{7F_1}{12} \rightarrow 2$$

$$F_3 = \frac{2F_1}{12} \rightarrow 3$$

by substituting 2, 3 in 1

$$14F = 24F_1 + \frac{21 \times 7}{12}F_1 + \frac{4 \times 2}{12}F_1 = 6.99313 \times 10^3 F$$

$$F_1 = \frac{168}{443} F$$

Tension

$$\sigma_t = \frac{F_1}{A} = \frac{168 F}{443 \times \frac{\pi}{4} (0.85 \times 6)^2}$$

$$= 0.01856416082 F$$

$$\sigma_{max} = \frac{\sigma_t}{2} + \sqrt{\left(\frac{\sigma_t}{2}\right)^2 + \tau^2}$$

$$\sigma_o = 0.2177561141 F$$

$$F = 275.53 N$$

Shear

$$\tau = \frac{F}{nA} = \frac{F}{7 \times \frac{\pi}{4} (0.85 \times 6)^2}$$