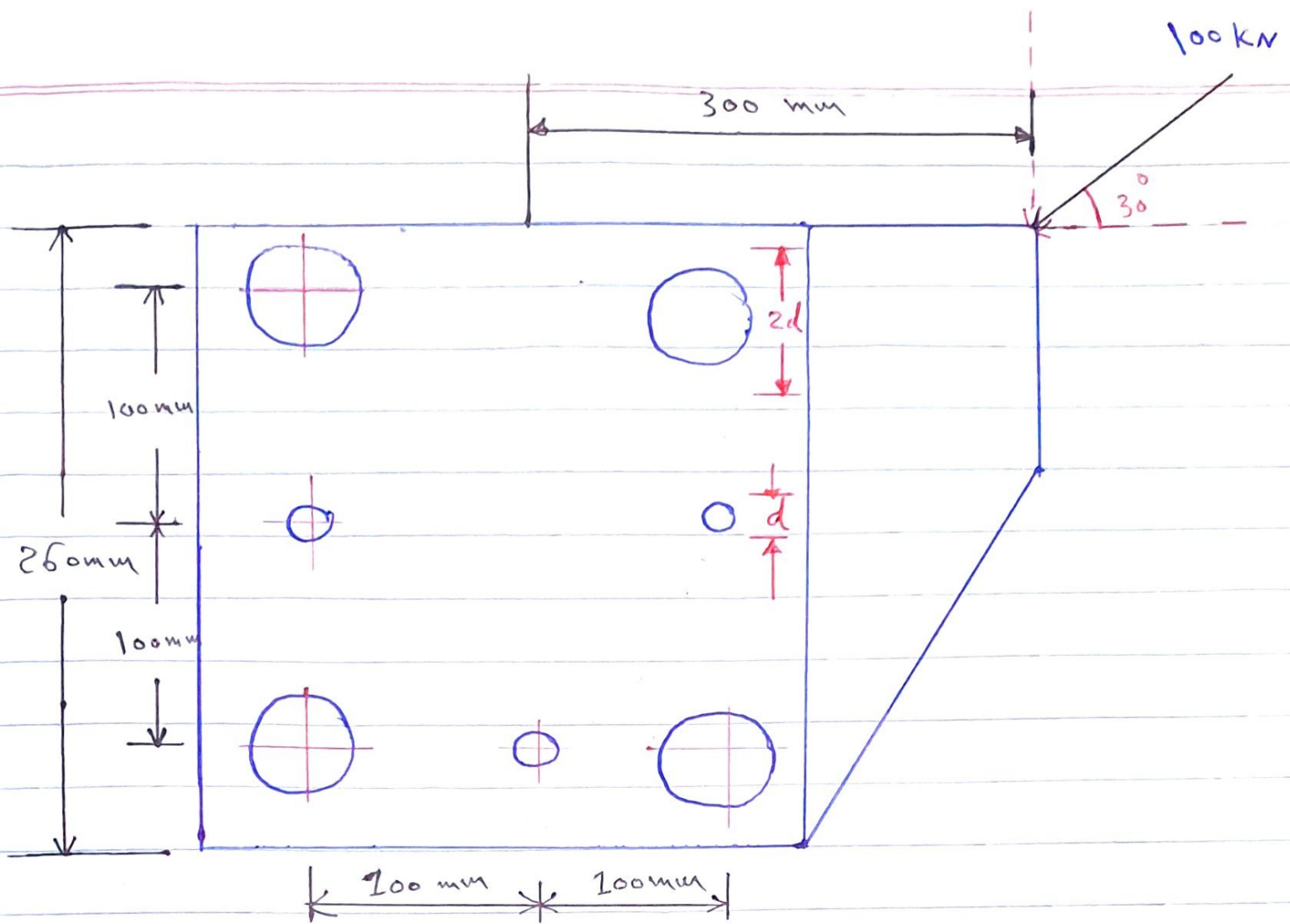


سيف حميد مسلم

المرحلى الثالثة

الميكانيك العام

**تصاميم - 2 - H.W**



$$\tau = 65 \text{ MPa}$$

$$P = 100 \text{ kN}$$

find d ?

Solution:

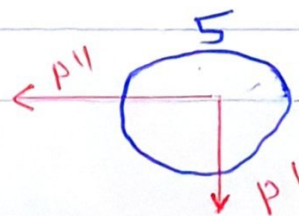
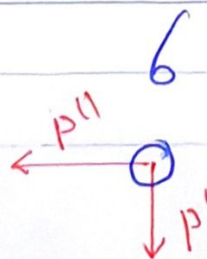
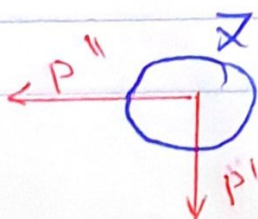
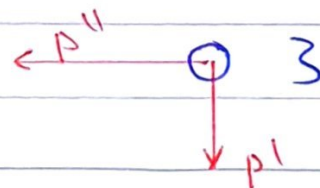
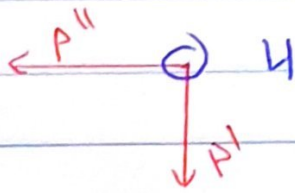
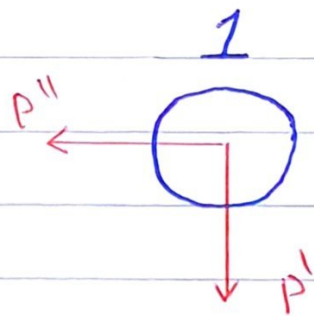
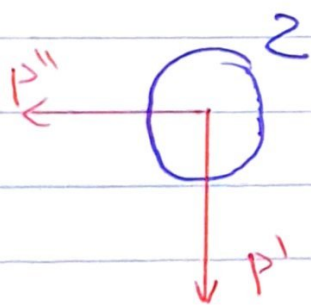
$$\bar{y} = \frac{\sum A \bar{y}}{\sum A} = \frac{8A(0) + 2A(100) + 9A(200)}{19A}$$

$$\bar{y} = 105.26 \text{ mm}$$

shear force:

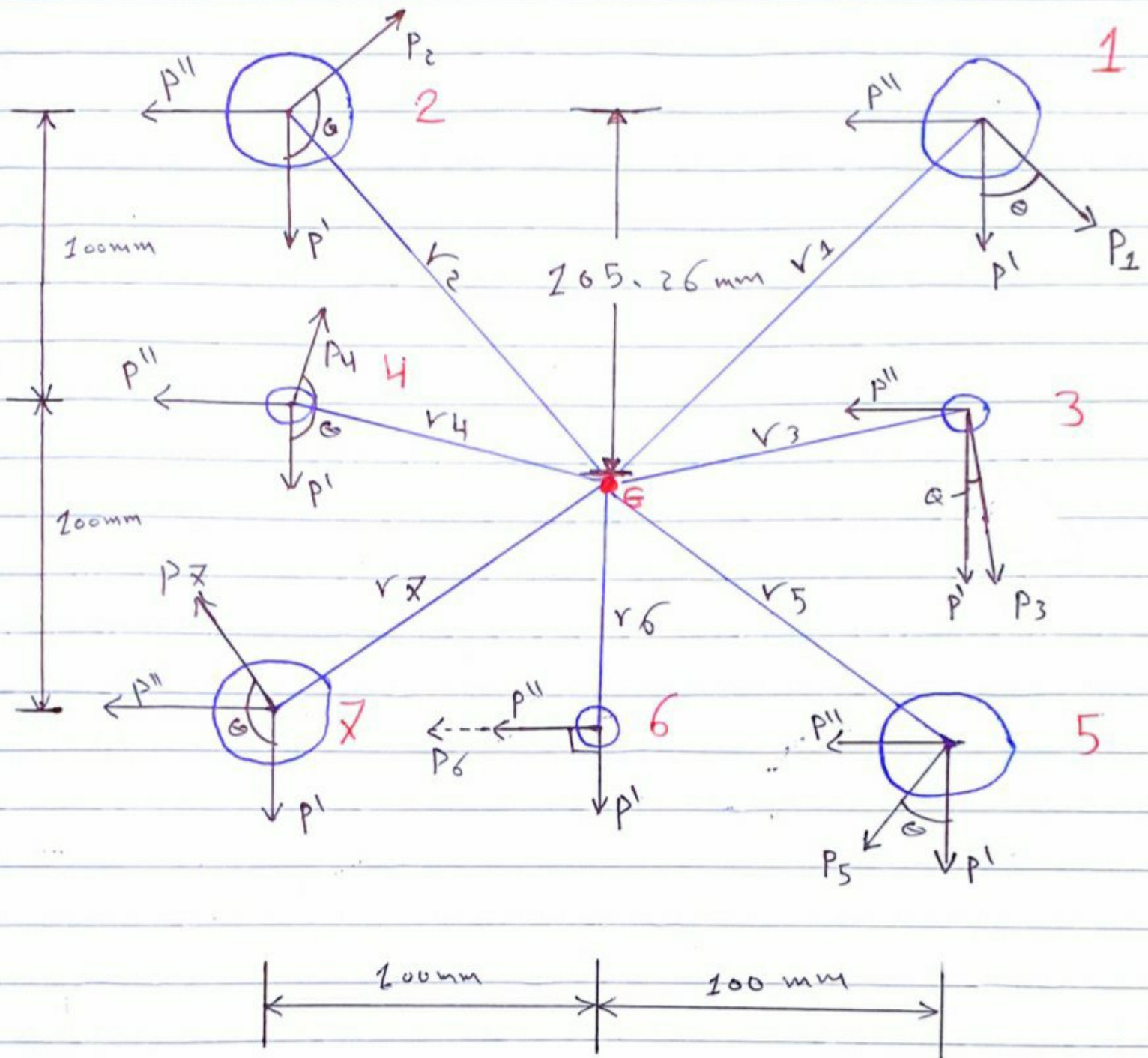
$$P' = \frac{100 \times 10^3 \times \sin 30^\circ}{2} = 2142.85 \text{ N} \quad \downarrow$$

$$P'' = \frac{100 \times 10^3 \times \cos 30^\circ}{2} = 12372 \text{ N} \quad \leftarrow$$



$$+\curvearrowright \sum T = 100 \times 10^3 \times \sin 30^\circ (300) - 100 \times 10^3 \times \cos 30^\circ (30 + 105.26)$$

$$\sum T = 3286140.4 \text{ N}\cdot\text{mm} \curvearrowright \text{ (مع عزب الطاقة)}$$



$$r_1 = r_2 = \sqrt{(100)^2 + (105.26)^2} = 145.2 \text{ mm}$$

$$r_3 = r_4 = \sqrt{(100)^2 + (105.26 - 200)^2} = 200.14 \text{ mm}$$

$$r_5 = r_7 = \sqrt{(100)^2 + (200 - 105.26)^2} = 137.75 \text{ mm}$$

$$r_6 = 200 - 105.26 = 94.74 \text{ mm}$$

$$\Sigma T = P_1 r_1 \left[ 1 + \left( \frac{r_2}{r_1} \right)^2 + \left( \frac{r_3}{r_1} \right)^2 + \left( \frac{r_4}{r_1} \right)^2 + \left( \frac{r_5}{r_1} \right)^2 + \left( \frac{r_6}{r_1} \right)^2 + \left( \frac{r_7}{r_1} \right)^2 \right]$$

$$\therefore r_1 = r_2$$

$$r_3 = r_4$$

$$r_5 = r_7$$

$$\sum T = P_1 r_1 \left[ 1 + 1 + 2 \left( \frac{r_3}{r_1} \right)^2 + 2 \left( \frac{r_5}{r_1} \right)^2 + \left( \frac{r_6}{r_1} \right)^2 \right]$$

$$3286140.4 = P_1 \times 145.2 \left[ 2 + 2 \left( \frac{100.14}{145.2} \right)^2 + 2 \left( \frac{137.75}{145.2} \right)^2 + \left( \frac{94.74}{145.2} \right)^2 \right]$$

$$3286140.4 = P_1 \times 25.7$$

$$P_1 = 4371.6 \text{ N}$$

$$\therefore r_1 = r_2$$

$$\therefore P_2 = 4371.6 \text{ N}$$

$$\frac{P_1}{P_3} = \frac{r_1}{r_3} \Rightarrow \frac{4321.6}{P_3} = \frac{145.2}{200.14}$$

$$P_3 = 3014.95 \text{ N} = P_4$$

$$\frac{P_1}{P_5} = \frac{r_1}{r_5} \Rightarrow \frac{4321.6}{P_5} = \frac{145.2}{132.25}$$

$$P_5 = P_2 = 4142.3 \text{ N}$$

$$\frac{P_1}{P_6} = \frac{r_1}{r_6}$$

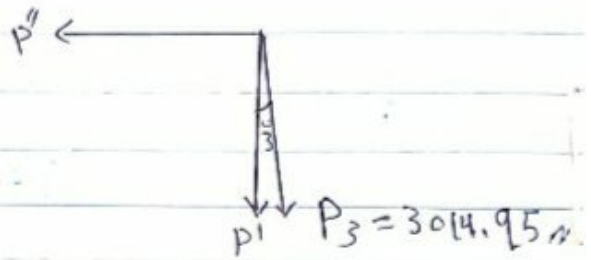
$$\frac{4321.6}{P_6} = \frac{145.2}{94.24} \Rightarrow P_6 = 2852.4 \text{ N}$$

rivet - 3 -

$$\alpha = 3^\circ$$

$$\rightarrow F_x = 3014.95 \times \sin 3^\circ - 123.22$$

$$F_x = 12214.2 \text{ N} \leftarrow$$



$$\uparrow F_y = -7142.85 - 3014.95 \cos 3^\circ$$

$$F_y = 10153.2 \text{ N} \downarrow$$

$$R_3 = \sqrt{F_x^2 + F_y^2}$$

$$= \sqrt{(12214.2)^2 + (10153.2)^2}$$

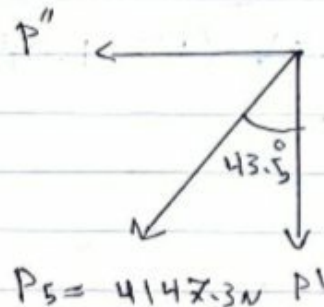
$$R_3 = 15883.46 \text{ N}$$

rivet - 5 -

$$\alpha = 43.5^\circ$$

$$\rightarrow F_x = -4147.3 \times \sin 43.5^\circ - 123.22$$

$$F_x = 15226.8 \text{ N} \leftarrow$$



$$\uparrow F_y = -4147.3 \times \cos 43.5^\circ - 7142.85$$

$$F_y = 10151.2 \text{ N} \downarrow$$

$$R_5 = \sqrt{(F_x)^2 + (F_y)^2}$$

$$R_5 = \sqrt{(15226.8)^2 + (10151.2)^2} = 18300.3 \text{ N}$$

Rivet - 6 -

$$\rightarrow F_x = -2852.4 - 12322 = 15224.4 \text{ N} \leftarrow$$

$$\uparrow F_y = -2142.85 \text{ N} = 2142.85 \text{ N} \downarrow$$

$$R_6 = \sqrt{(15224.4)^2 + (2142.85)^2} = 16816.7 \text{ N}$$

من الرفت هنا هو الأخطر لان يمتلك

اكبر حصة من القوة

$$\gamma = \frac{18300.3}{\frac{\pi}{4} (2d)^2}$$

$$65 = \frac{18300.3}{\frac{\pi}{4} (2d)^2}$$

$$d = 9.47 \text{ mm}$$