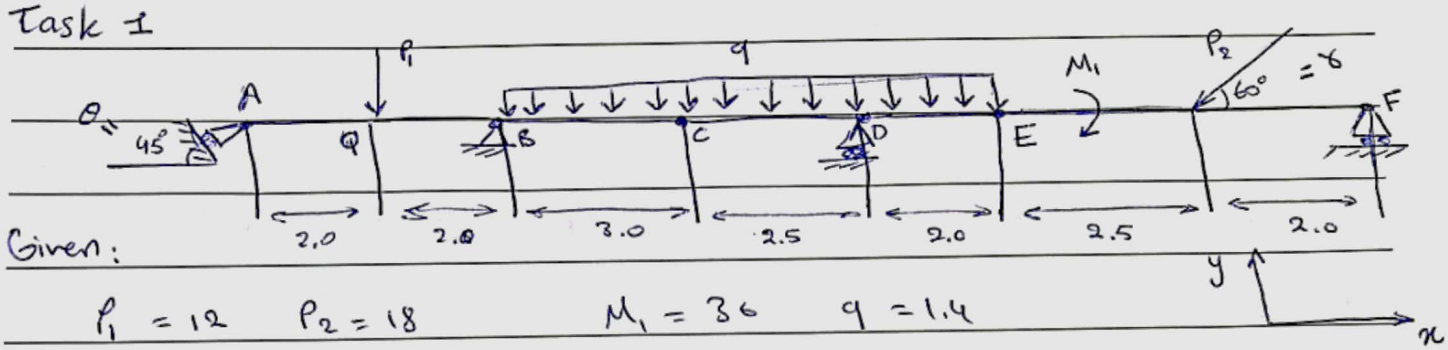
Task 1



* Given:

$P_1 = 12 \quad P_2 = 18 \quad M_1 = 36 \quad q = 1.4$

* Research objects

- A, D, F roller supports
- AF rigid rod with connections in C and E
- B pen connection (rotating joint)
- C, E joints / bearings with 0 torque

* Force analysis:

- $R_A = \begin{cases} R_{Ax} = R_A \cos(90-\theta) \\ R_{Ay} = R_A \sin(90-\theta) \end{cases}$
- $R_B = \begin{cases} -R_{Bx} \\ +R_{By} \end{cases}$
- $R_F = R_{Fy}$
- $F_q = q \cdot BE$
- $-M_1$
- $P_2 = \begin{cases} -P_2 \cos\gamma \\ -P_2 \sin\gamma \end{cases}$
- $R_D = R_{Dy}$

* Solution: ① body AC

$\Sigma F_x = 0 \Rightarrow -R_{Bx} + R_A \cos(90-\theta) = 0 \Rightarrow R_{Bx} = R_A \cos(90-\theta)$

$\Sigma F_y = 0 \Rightarrow R_A \sin(90-\theta) + R_{By} - q \cdot BC - P_1 = 0$

$\Sigma T_A = 0 \Rightarrow R_{By} \cdot AB - (q \cdot BC)\left(\frac{BC}{2} + AB\right) - P_1 AQ = 0$

(2) whole rod

$$\Sigma F_x = 0$$

$$-R_{Bx} + R_A \cos(90-\theta) - P_2 \cos\gamma = 0$$

$$\Sigma F_y = 0$$

$$R_A \sin(90-\theta) + R_{By} - q(BE) + R_{oy} - P_2 \sin\gamma + R_f - P_1 = 0$$

$$\Sigma T_A = 0$$

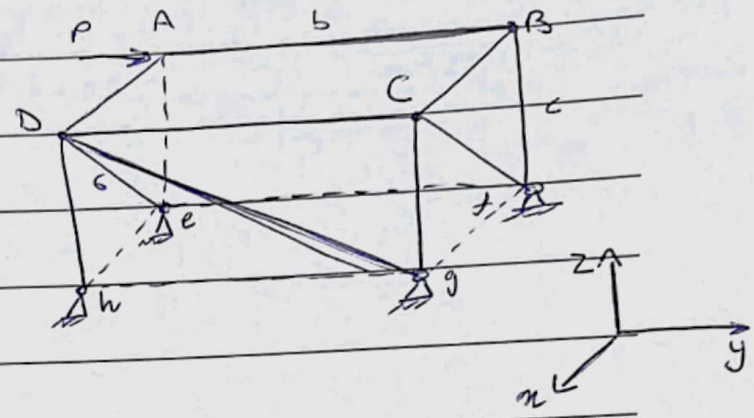
$$R_{By}(AB) + R_{oy}(AD) - M_1 + R_F \cdot AF - P_1 AQ - q\left(\frac{BE}{2} + AB\right) = 0$$

Task 2 :

* Given:

$G = 18 \quad P = 30$

$a = 4 \quad b = 4.5 \quad c = 3.5$



* Research object:

- plane ABCD
- 6 rods connected with ABCD
- e, f, g, h rotational joints

* Force Analysis:

- $R_e = \begin{cases} +R_{ex} \\ +R_{ey} \\ +R_{ez} \end{cases}$
- $R_f = \begin{cases} R_{fx} \\ -R_{fy} \\ R_{fz} \end{cases}$
- $R_g = \begin{cases} -R_{gx} \\ -R_{gy} \\ R_{gz} \end{cases}$
- $R_h = \begin{cases} -R_{hx} \\ R_{hy} \\ R_{hz} \end{cases}$
- $G = \begin{cases} 0 \\ 0 \\ -G_z \end{cases}$
- $P = \begin{cases} 0 \\ P_y \\ 0 \end{cases}$

* Solution

$\sum \vec{F}_x = \vec{0}$

$-R_{hx} - R_{gx} + R_{fx} + R_{ex} = 0$

$\sum \vec{F}_y = \vec{0}$

$R_{hy} - R_{gy} - R_{fy} + R_{ey} + P_y = 0$

$\sum \vec{F}_z = \vec{0}$

$R_{hz} + R_{gz} + R_{fz} + R_{ez} - G_z = 0$

$\vec{T} = \vec{F} \times \vec{r} \qquad \sum \vec{T}_e, \sum \vec{T}_f, \sum \vec{T}_g, \sum \vec{T}_h = \vec{0}$