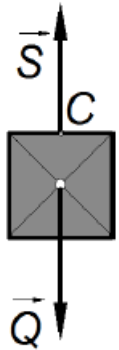


1. Feladat

$G = 6 \text{ kN}, \quad Q = 10 \sqrt{2} \text{ kN}$

I.rendszer:

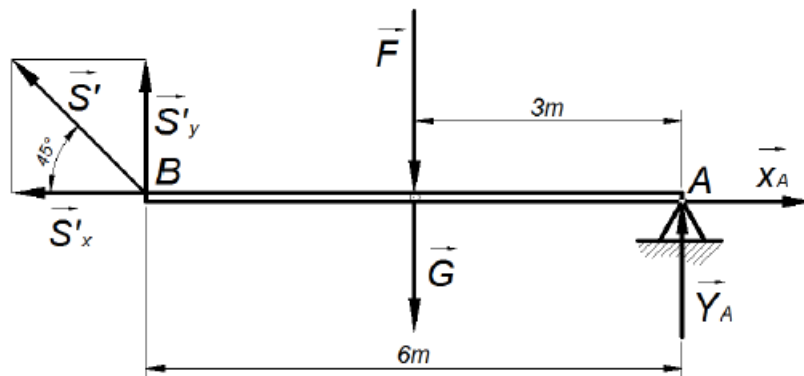


$$\sum Y_i = 0 \Rightarrow S - Q = 0$$

$$S - 10\sqrt{2} = 0$$

$$S = 10\sqrt{2} \text{ kN}$$

II.rendszer:



$$S' = S = 10\sqrt{2} \text{ kN}$$

$$S'_x = S' \cos 45^\circ = 10\sqrt{2} \frac{\sqrt{2}}{2} = 10 \text{ kN}$$

$$S'_y = S' \sin 45^\circ = 10\sqrt{2} \frac{\sqrt{2}}{2} = 10 \text{ kN}$$

$$(1) \sum X_i = 0 \quad \leftarrow^- \rightarrow^+$$

$$(2) \sum Y_i = 0 \quad \downarrow^- \uparrow^+$$

$$(3) \sum M_A = 0 \quad \cup^- \cup^+$$

$$(1) X_A - S'_x = 0$$

$$(2) Y_A - F - G + S'_y = 0$$

$$(3) -S'_y \cdot 6 + F \cdot 3 + G \cdot 3 = 0$$

$$(1) \Rightarrow X_A - 10 = 0$$

$$X_A = 10 \text{ kN}$$

$$(3) \Rightarrow -10 \cdot 6 + F \cdot 3 + 6 \cdot 3 = 0$$

$$-60 + 3F + 18 = 0$$

$$3F - 42 = 0$$

$$3F = 42$$

$$F = 14 \text{ kN}$$

$$(2) \Rightarrow Y_A - 14 - 6 + 10 = 0$$

$$Y_A - 10 = 0$$

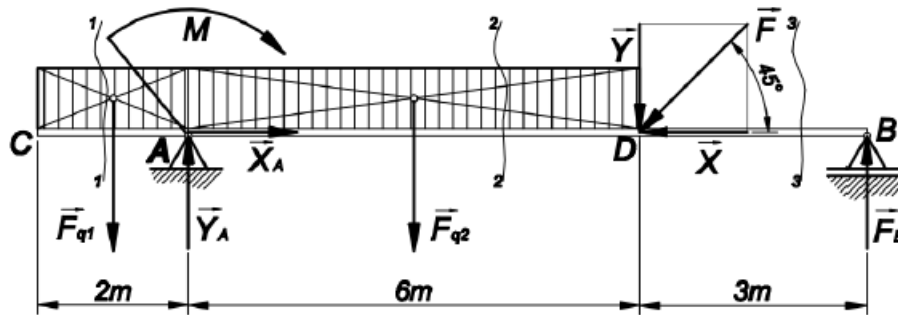
$$Y_A = 10 \text{ kN}$$

$$F_A = \sqrt{X_A^2 + Y_A^2} = \sqrt{10^2 + 10^2} = 10\sqrt{2} \text{ kN}$$

$$F_A = 10\sqrt{2} \text{ kN}$$

2. Feladat

$$F = 3\sqrt{2} \text{ kN}, \quad M = 13 \text{ kNm}, \quad q = 2 \frac{\text{kN}}{\text{m}}$$



$$X = F \cos 45^\circ = 3\sqrt{2} \frac{\sqrt{2}}{2} = 3 \text{ kN}$$

$$Y = F \sin 45^\circ = 3\sqrt{2} \frac{\sqrt{2}}{2} = 3 \text{ kN}$$

$$F_{q1} = q \cdot 2 = 2 \cdot 2 = 4 \text{ kN}$$

$$F_{q2} = q \cdot 6 = 2 \cdot 6 = 12 \text{ kN}$$

$$(1) \sum X_i = 0 \quad \leftarrow \rightarrow^+$$

$$(2) \sum Y_i = 0 \quad \downarrow \uparrow^+$$

$$(3) \sum M_A = 0 \quad \cup \cap^+$$

$$(1) X_A - X = 0$$

$$(2) -F_{q1} + Y_A - F_{q2} - Y + F_B = 0$$

$$(3) F_{q1} \cdot 1 - M - F_{q2} \cdot 3 - Y \cdot 6 + F_B \cdot 9 = 0$$

$$(1) \Rightarrow X_A - 3 = 0$$

$$X_A = 3 \text{ kN}$$

$$(3) \Rightarrow 4 \cdot 1 - 13 - 12 \cdot 3 - 3 \cdot 6 + 9F_B = 0$$

$$4 - 13 - 36 - 18 + 9F_B = 0$$

$$9F_B - 63 = 0$$

$$9F_B = 63$$

$$F_B = \frac{63}{9}$$

$$F_B = 7 \text{ kN}$$

$$(2) \Rightarrow -4 + Y_A - 12 - 3 + 7 = 0$$

$$Y_A - 12 = 0$$

$$Y_A = 12 \text{ kN}$$

$$F_A = \sqrt{X_A^2 + Y_A^2} = \sqrt{3^2 + 12^2} = \sqrt{9 + 144} = \sqrt{153} \text{ kN}$$

$$F_A = \sqrt{153} \text{ kN}$$

AC mező (1-1 metszet)

$$0 \leq x \leq 2 \text{ m}$$

$$F_a^I = 0$$

$$F_t^I = -qx = -2x$$

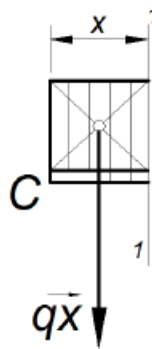
$$x = 0 \Rightarrow F_t^I = 0$$

$$x = 2 \text{ m} \Rightarrow F_t^I = -2 \cdot 2 = -4 \text{ kN}$$

$$M_f^I = -qx \cdot \frac{x}{2} = -2x \cdot \frac{x}{2} = -x^2$$

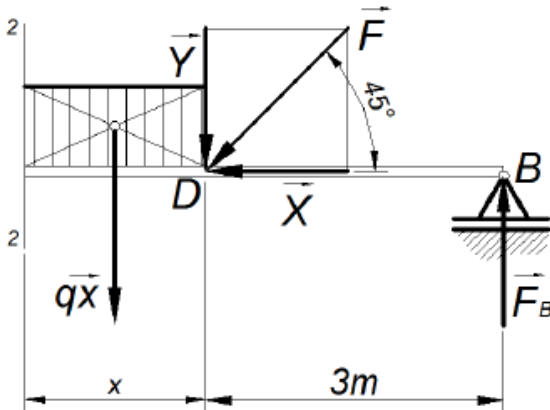
$$x = 0 \Rightarrow M_f^I = 0$$

$$x = 2 \text{ m} \Rightarrow M_f^I = -2^2 = -4 \text{ kNm}$$



DA mező (2-2 metszet)

$$0 \leq x \leq 6 \text{ m}$$



$$F_a^d = -X = -3 \text{ kN}$$

$$F_t^d = qx + Y - F_B = 2x + 3 - 7 = 2x - 4$$

$$x = 0 \Rightarrow F_t^d = -4kN$$

$$x = 6m \Rightarrow F_t^d = 2 \cdot 6 - 4 = 12 - 4 = 8kN$$

$$M_f^d = -qx \cdot \frac{x}{2} - Y \cdot x + F_B \cdot (3 + x) = -2 \cdot \frac{x^2}{2} - 3x + 7(3 + x) = -x^2 - 3x + 21 + 7x$$

$$M_f^d = -x^2 + 4x + 21$$

$$x = 0 \Rightarrow M_f^d = 21kNm$$

$$x = 6m \Rightarrow M_f^d = -6^2 + 4 \cdot 6 + 21 = -36 + 24 + 21 = 9kNm$$

$$F_t^d = 0 \Rightarrow 2x - 4 = 0$$

$$2x = 4$$

$$x = 2m$$

$$M_{max}^d = M_{x=2m} = -2^2 + 4 \cdot 2 + 21 = -4 + 8 + 21 = 25kNm$$

BD mező (3-3 metszet)

$$0 \leq x \leq 3m$$

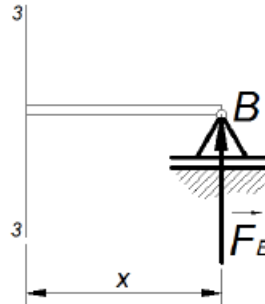
$$F_a^d = 0$$

$$F_t^d = -F_B = -7kN$$

$$M_f^d = F_B \cdot x = 7x$$

$$x = 0 \Rightarrow M_f^d = 0$$

$$x = 3m \Rightarrow M_f^d = 7 \cdot 3 = 21kNm$$



A könnyű átnézés érdekében:

Axiális erők:

$$F_{aC} = 0$$

$$F_{aA}^l = 0$$

$$F_{aA}^d = -3kN$$

$$F_{aD}^l = -3kN$$

$$F_{aD}^d = 0$$

$$F_{aB} = 0$$

Nyíró erők:

$$F_{tC} = 0$$

$$F_{tA}^l = -4kN$$

$$F_{tA}^d = 8kN$$

$$F_{tD}^l = -4kN$$

$$F_{tD}^d = -7kN$$

$$F_{tB} = -7kN$$

Hajlító nyomatékok

$$M_{fC} = 0$$

$$M_{fA}^l = -4kNm$$

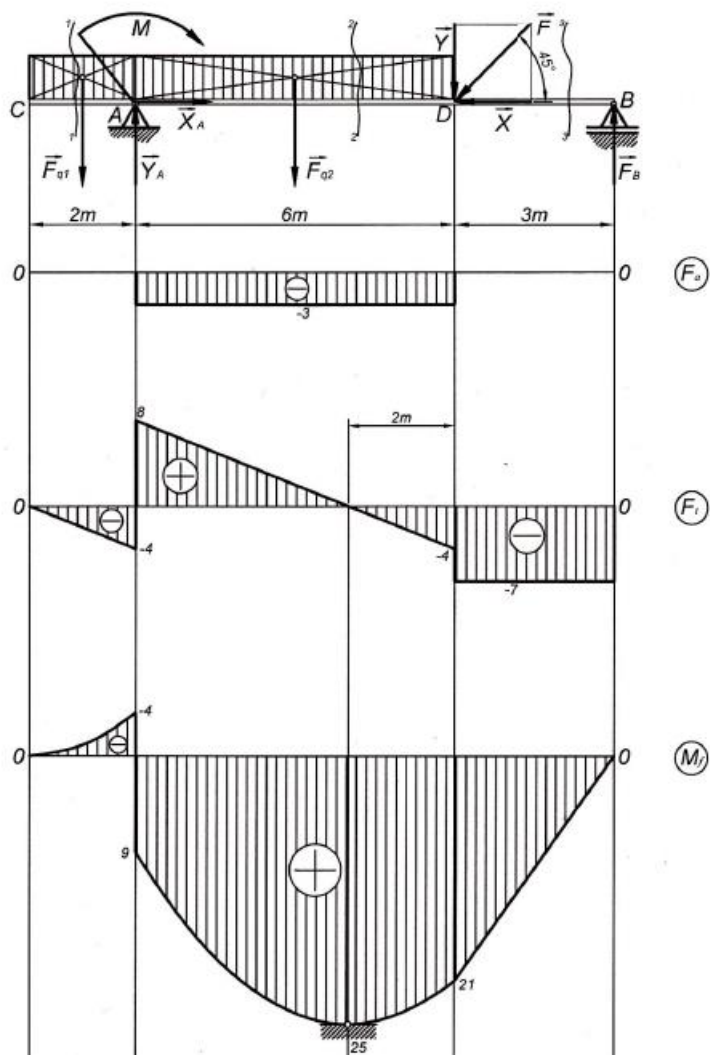
$$M_{fA}^d = 9kNm$$

$$M_{fD} = 21kNm$$

$$M_{fB} = 0$$

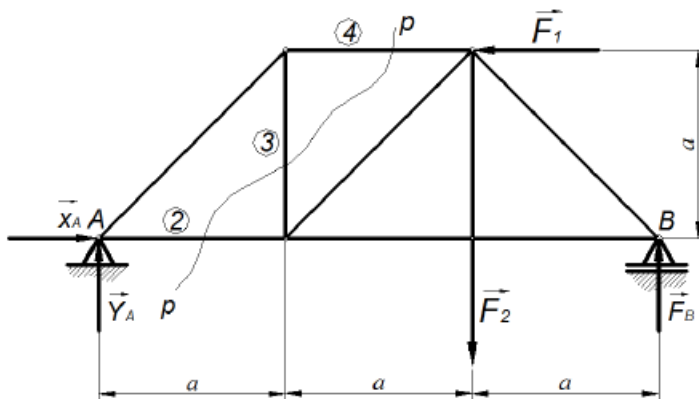
$$M_{fmax} = 25kNm$$

STATIKUS DIAGRAMOK



3. Feladat

$$F_1 = 1\text{kN}, \quad F_2 = 5\text{kN}, \quad a = 1\text{m}$$



$$(1) \sum X_i = 0 \leftarrow \rightarrow^+$$

$$(2) \sum Y_i = 0 \downarrow \uparrow^+$$

$$(3) \sum M_A = 0 \cup \cap^+$$

$$(1) X_A - F_1 = 0$$

$$(2) Y_A - F_2 + F_B = 0$$

$$(3) F_1 \cdot a - F_2 \cdot 2a + F_B \cdot 3a = 0 / : a$$

$$(1) \Rightarrow X_A - 1 = 0$$

$$X_A = 1 \text{ kN}$$

$$(3) \Rightarrow 1 - 5 \cdot 2 + 3F_B = 0$$

$$1 - 10 + 3F_B = 0$$

$$3F_B = 9$$

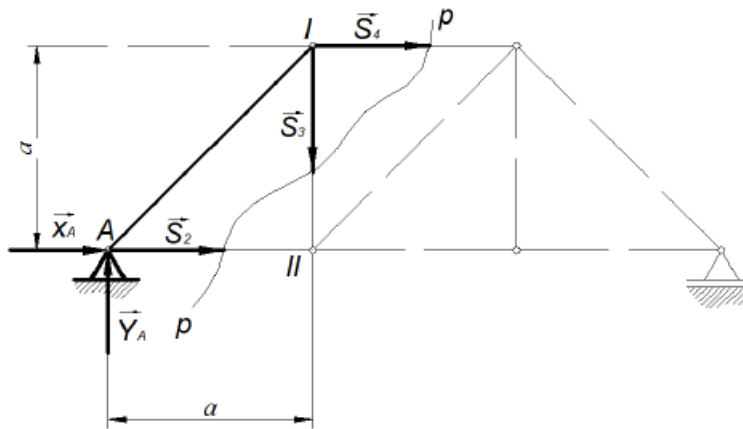
$$F_B = 3 \text{ kN}$$

$$(2) \Rightarrow Y_A - 5 + 3 = 0$$

$$Y_A = 2 \text{ kN}$$

$$F_A = \sqrt{X_A^2 + Y_A^2} = \sqrt{1^2 + 2^2} = \sqrt{5} \text{ kN}$$

$$F_A = \sqrt{5} \text{ kN}$$



$$(1) \sum M_I = 0 \Rightarrow X_A \cdot a + S_2 \cdot a - Y_A \cdot a = 0 / : a$$

$$X_A + S_2 - Y_A = 0$$

$$1 + S_2 - 2 = 0$$

$$S_2 - 1 = 0$$

$$S_2 = 1 \text{ kN}$$

$$(2) \sum M_{II} = 0 \Rightarrow -Y_A \cdot a - S_4 \cdot a = 0 / : a$$

$$-Y_A - S_4 = 0$$

$$-2 - S_4 = 0$$

$$S_4 = -2 \text{ kN}$$

$$(3) \sum M_A = 0 \Rightarrow -S_4 \cdot a - S_3 \cdot a = 0 / : a$$

$$-S_4 - S_3 = 0$$

$$2 - S_3 = 0$$

$$S_3 = 2 \text{ kN}$$

