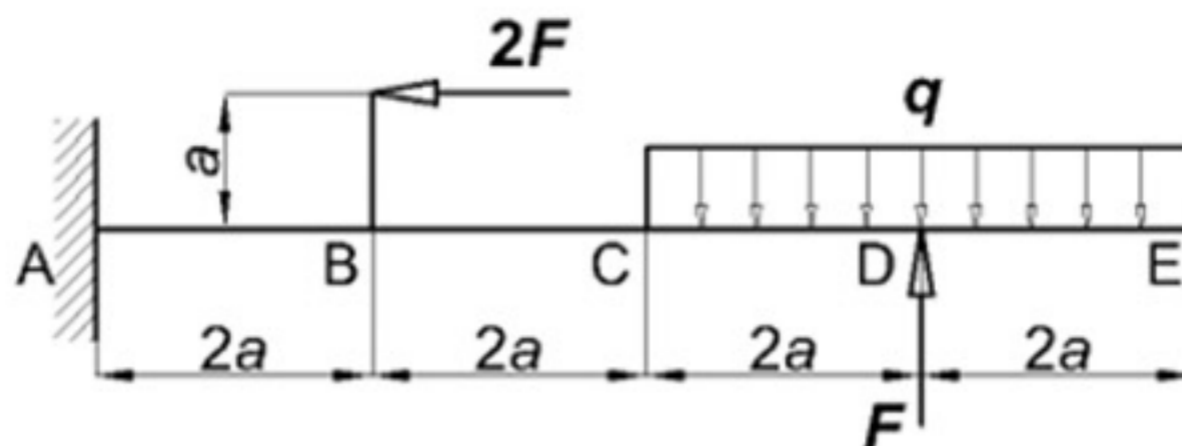
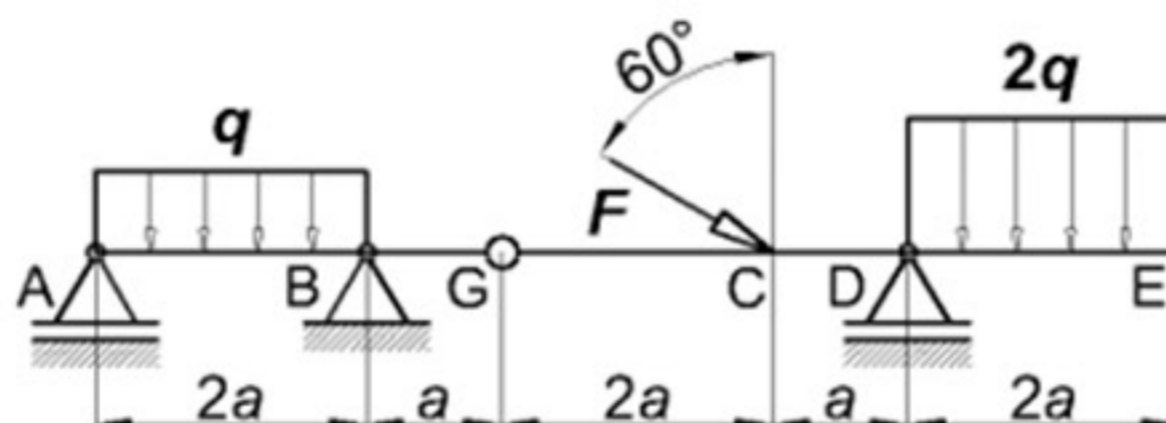


ПОПРАВНИ ДРУГОГ КОЛОКВИЈУМА ИЗ ТЕХНИЧКЕ МЕХАНИКЕ I

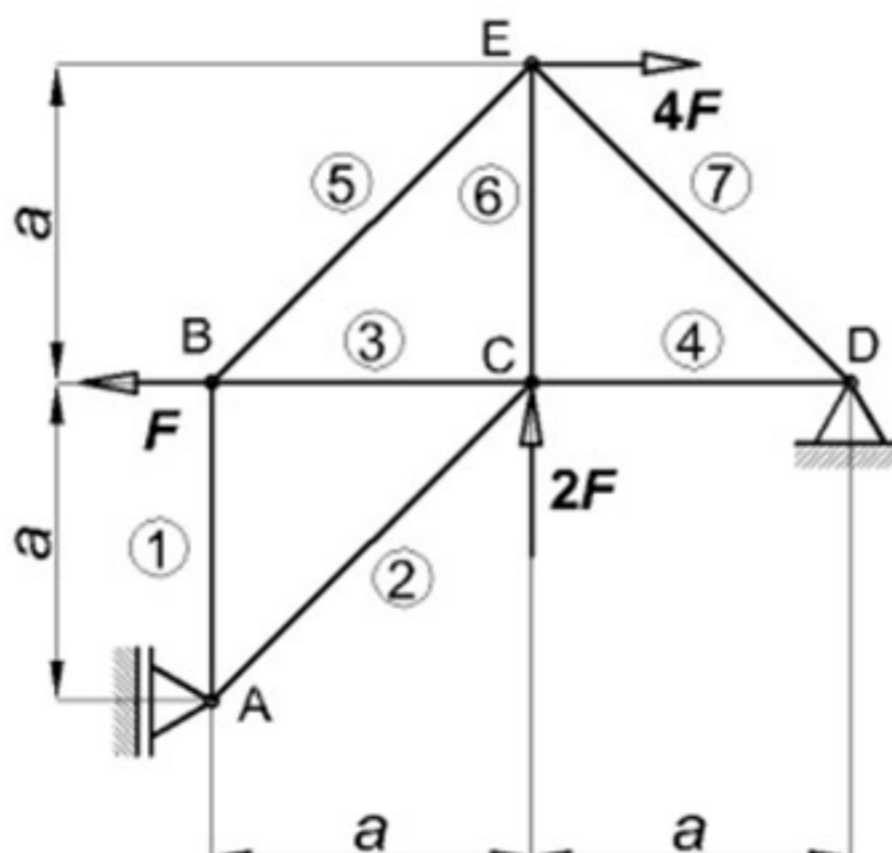
1. Одредити реакције веза носача приказаног на слици, а потом нацртати статичке дијаграме. Дато је: $F = 6 \text{ kN}$, $q = 2 \text{ kN/m}$ и $a = 0,25 \text{ m}$.



2. Одредити реакције веза носача приказаног на слици, а потом нацртати статичке дијаграме. Дато је: $F = 16 \text{ kN}$, $q = 1 \text{ kN/m}$ и $a = 1 \text{ m}$.



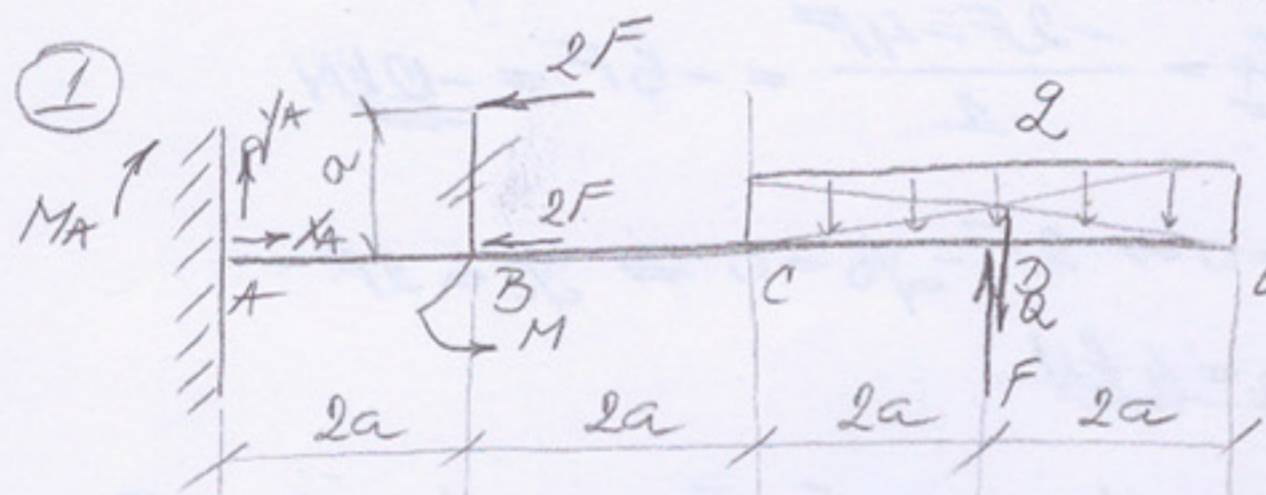
3. Одредити силе у штаповима решетке приказане на слици методом исијецања чворова и утврдити врсту оптерећења којем су штапови изложени. Потом провјерити добијене резултате Ритеровом методом за штапове 2, 3 и 5. Дато је: $F = 2 \text{ kN}$ и $a = 1 \text{ m}$.



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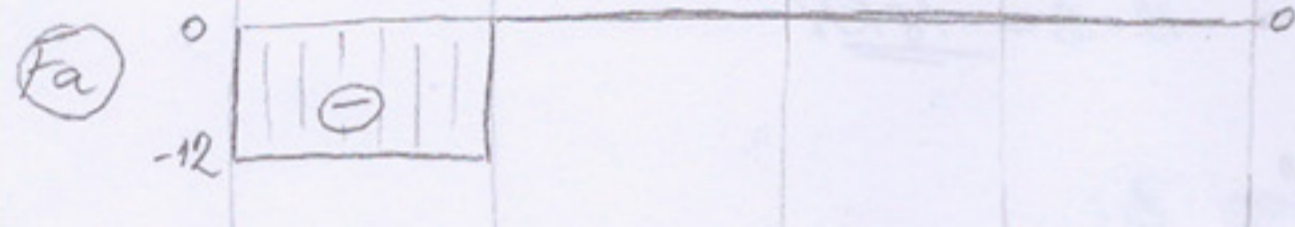
$$M = 2Fa = 2 \cdot 6 \cdot 0,25 = 3 \text{ kNm}$$

$$Q = 4aq = 4 \cdot 0,25 \cdot 2 = 2 \text{ kN}$$

$$\sum X_i = 0 \Rightarrow X_A - 2F = 0 \Rightarrow X_A = 12 \text{ kN}$$

$$\sum Y_i = 0 \Rightarrow Y_A + F - Q = 0$$

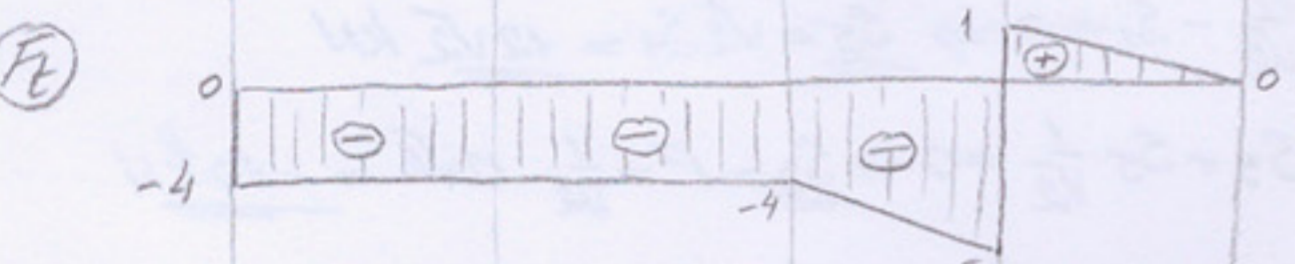
$$Y_A = Q - F = 2 - 6 = -4 \text{ kN}$$



$$\sum M_A = 0 \Rightarrow M_A - M - F \cdot 6a + Q \cdot 6a = 0$$

$$M_A = M + 6Fa - 6aQ = 3 + 6 \cdot 0,25(6 - 2)$$

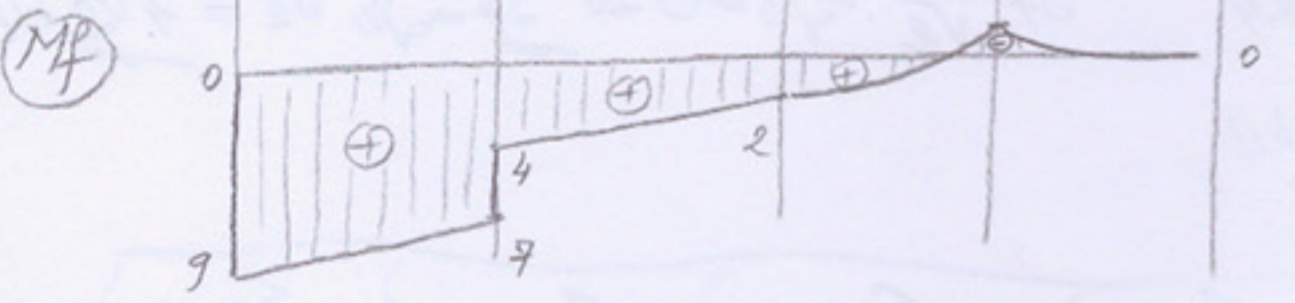
$$M_A = 9 \text{ kNm}$$



$$M_A^l = 0$$

$$M_{AD}^l = M_A = 9 \text{ kNm}$$

$$M_{BL}^l = M_A + Y_A \cdot 2a = 9 - 4 \cdot 2 \cdot 0,25 = 7 \text{ kNm}$$



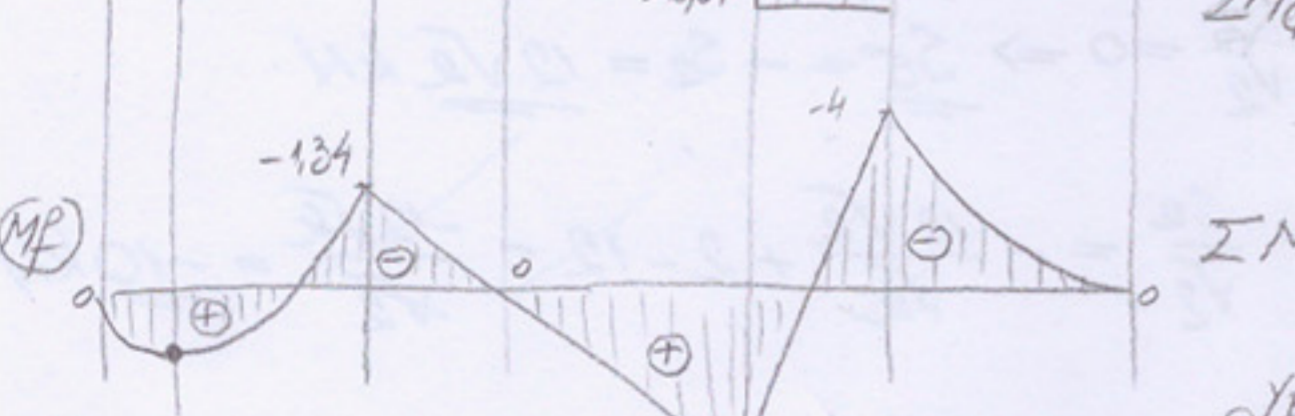
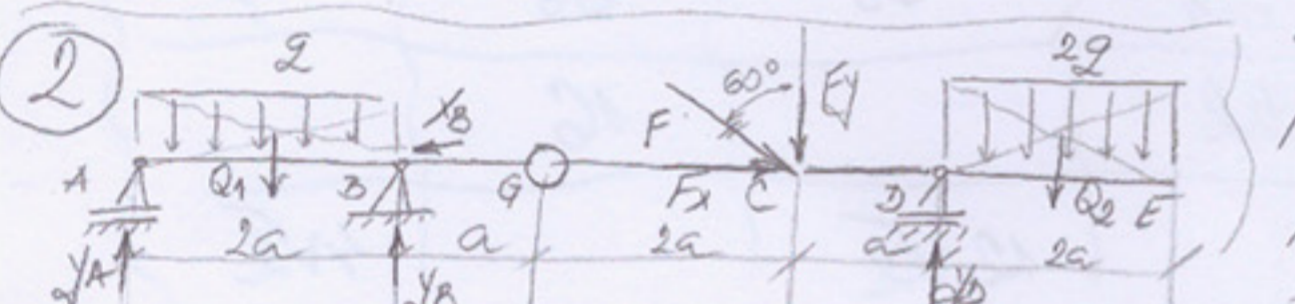
$$M_{BD}^l = M_A + Y_A \cdot 2a - M = 7 - 3 = 4 \text{ kNm}$$

$$M_C^l = M_A + Y_A \cdot 4a - M = 9 - 4 \cdot 4 \cdot 0,25 - 3 = 2 \text{ kNm}$$

$$M_D^l = F \cdot 2a - Q \cdot 2a = (6 - 2) \cdot 2 \cdot 0,25 = 2 \text{ kNm}$$

$$M_E^l = -9 \cdot 2a \cdot a = -2 \cdot 2 \cdot 0,25 \cdot 0,25 = -0,25 \text{ kNm}$$

$$M_E^d = 0$$



$$F_{By} = Y_A - 2 \cdot q_1 = 0$$

$$2a - \frac{Y_A}{2} = \frac{933}{2} = 933$$

$$M_A^l = Y_A \cdot 0,33 - 2 \cdot 0,33^2 = 9054 \text{ kNm}$$

$$Q_1 = 2aq_1 = 2 \cdot 1 \cdot 1 = 2 \text{ kN}$$

$$Q_2 = 2a \cdot 2q_2 = 2 \cdot 1 \cdot 2 \cdot 1 = 4 \text{ kN}$$

$$F_x = F \sin 60^\circ = 16 \frac{\sqrt{3}}{2} = 8\sqrt{3} \text{ kN}$$

$$F_y = F \cos 60^\circ = 16 \cdot \frac{1}{2} = 8 \text{ kN}$$

$$\sum X_i = 0 \Rightarrow -X_B + F_x = 0 \Rightarrow X_B = F_x = 8\sqrt{3} \text{ kN}$$

$$\sum M_G^d = 0 \Rightarrow -F_y \cdot 2a + Y_B \cdot 3a - Q_2 \cdot 4a = 0 \quad | :a$$

$$Y_B = \frac{2F_y + 4Q_2}{3} = \frac{2 \cdot 8 + 4 \cdot 4}{3} = \frac{32}{3} = 10,67 \text{ kN}$$

$$\sum M_A = 0 \Rightarrow -Q_1 \cdot a + Y_B \cdot 2a - F_y \cdot 5a + Y_B \cdot 6a - Q_2 \cdot 7a = 0$$

$$Y_B = \frac{Q_1 + 5F_y - 6Y_B + 7Q_2}{2} = \frac{2 + 5 \cdot 8 - 6 \cdot \frac{32}{3} + 7 \cdot 4}{2} = 3 \text{ kN}$$

$$\sum Y_i = 0 \Rightarrow Y_A + Y_B + Y_B - Q_1 - Q_2 - F_y = 0$$

$$Y_A = Q_1 + Q_2 + F_y - Y_B - Y_B = 2 + 4 + 8 - 3 - 10,67 = 933 \text{ kN}$$

$$M_A^l = 0$$

$$M_B^l = Y_A \cdot 2a - Q_1 \cdot a = 933 \cdot 2 - 2 = -134 \text{ kNm}$$

$$M_B^d = -F_y \cdot 3a + Y_B \cdot 4a - Q_2 \cdot 5a$$

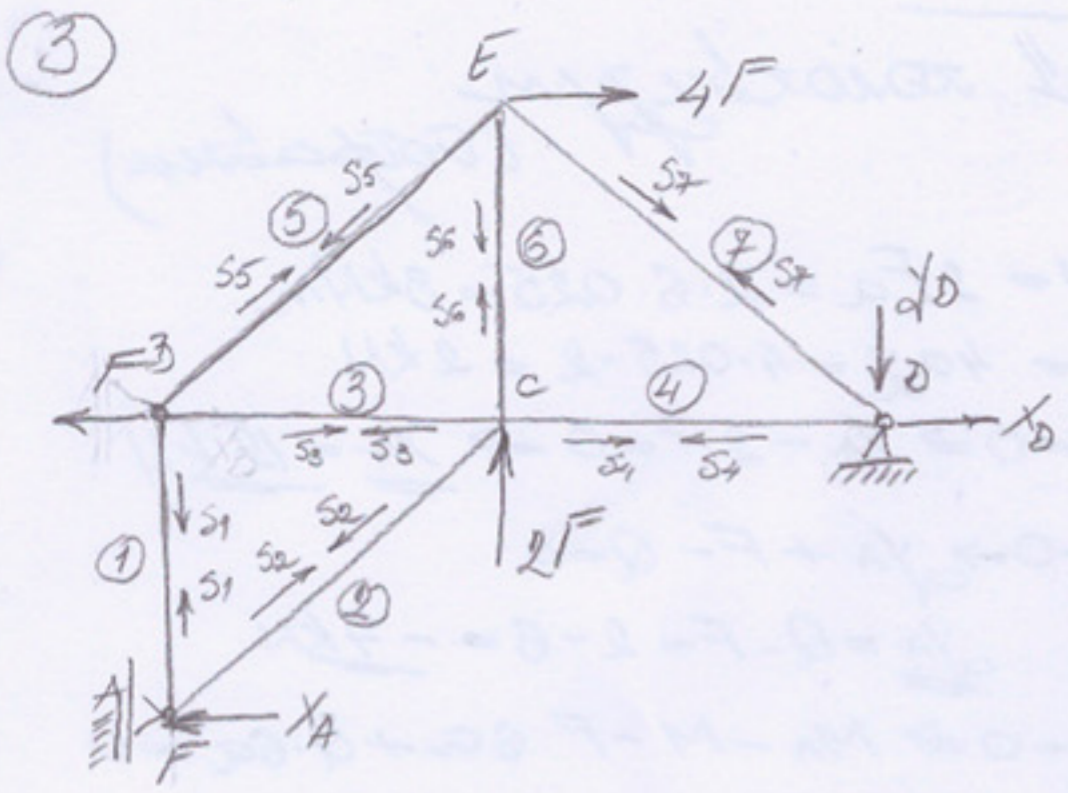
$$= -24 + 42,67 - 20 = -133 \text{ kNm}$$

$$M_G = 0$$

$$M_C^l = Y_B \cdot a - Q_2 \cdot 2a = 10,67 - 8 = 2,67 \text{ kNm}$$

$$M_D^l = -Q_2 \cdot a = -4 \text{ kNm}$$

$$M_E^d = 0$$



$$\sum M_D = 0 \Rightarrow 2F \cdot a + 4F \cdot a + X_A \cdot a = 0$$

$$X_A = \frac{-2F - 4F}{1} = -6F = -12 \text{ kN}$$

$$\sum Y_i = 0 \Rightarrow 2F - q_D = 0 \Rightarrow q_D = 2F$$

$$q_D = 4 \text{ kN}$$

$$\sum X_i = 0 \Rightarrow -X_A + X_D + 4F - F = 0 \Rightarrow X_D = X_A - 3F$$

$$X_D = -12 - 6 = -18 \text{ kN}$$

zBop A:

$$-X_A + S_2 \cdot \frac{1}{\sqrt{2}} = 0 \Rightarrow S_2 = \sqrt{2} X_A = -12\sqrt{2} \text{ kN}$$

zBop B:

$$S_5 \cdot \frac{1}{\sqrt{2}} - S_1 = 0 \Rightarrow S_5 = \sqrt{2} S_1 = 12\sqrt{2} \text{ kN}$$

$$S_1 + S_2 \cdot \frac{1}{\sqrt{2}} = 0 \Rightarrow S_1 = +\frac{1}{\sqrt{2}} \cdot 12\sqrt{2} = 12 \text{ kN}$$

$$-F + S_3 + S_5 \cdot \frac{1}{\sqrt{2}} = 0 \Rightarrow S_3 = F - \frac{1}{\sqrt{2}} \cdot 12\sqrt{2} = -10 \text{ kN}$$

zBop C:

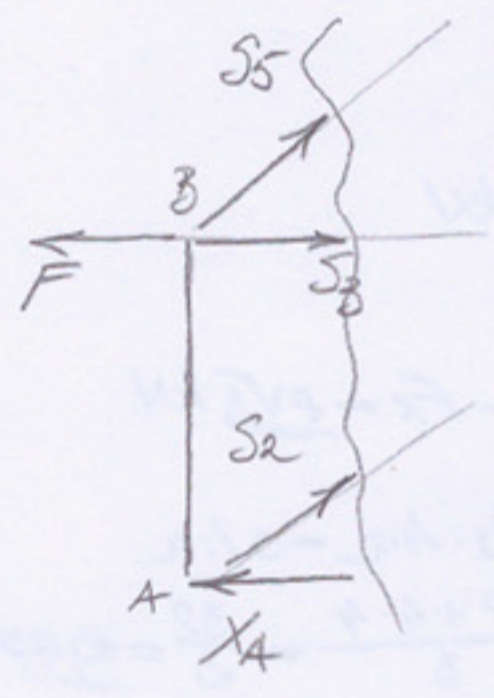
$$2F + S_6 - S_2 \cdot \frac{1}{\sqrt{2}} = 0 \Rightarrow S_6 = -4 + \frac{1}{\sqrt{2}} \cdot (-12\sqrt{2}) = -16 \text{ kN}$$

zBop D:

$$S_7 \cdot \frac{1}{\sqrt{2}} - q_D = 0 \Rightarrow S_7 = q_D \cdot \sqrt{2} = 4\sqrt{2} \text{ kN}$$

$$S_4 - S_3 - S_2 \cdot \frac{1}{\sqrt{2}} = 0 \Rightarrow S_4 = -10 - 12\sqrt{2} \cdot \frac{1}{\sqrt{2}} = -22 \text{ kN}$$

сила [кН]	S_1	S_2	S_3	S_4	S_5	S_6	S_7
спина		$12\sqrt{2}$	10	22		16	
натяжение	12				$12\sqrt{2}$		$4\sqrt{2}$



$$\sum M_B = 0 \Rightarrow S_2 \cdot \frac{1}{\sqrt{2}} \cdot a - X_A \cdot a = 0$$

$$S_2 = \sqrt{2} X_A = -12\sqrt{2} \text{ kN} = -16,97 \text{ kN}$$

$$\sum X_i = 0 \Rightarrow S_3 + S_5 \cdot \frac{1}{\sqrt{2}} - F - X_A + S_2 \cdot \frac{1}{\sqrt{2}} = 0$$

$$\sum Y_i = 0 \Rightarrow S_5 \cdot \frac{1}{\sqrt{2}} + \frac{S_2}{\sqrt{2}} = 0 \Rightarrow S_5 = -S_2 = 12\sqrt{2} \text{ kN}$$

$$S_3 = -\frac{S_5}{\sqrt{2}} + F + X_A - \frac{S_2}{\sqrt{2}} = -\frac{12\sqrt{2}}{\sqrt{2}} + 2 - 12 - \frac{-12\sqrt{2}}{\sqrt{2}} = -10 \text{ kN}$$