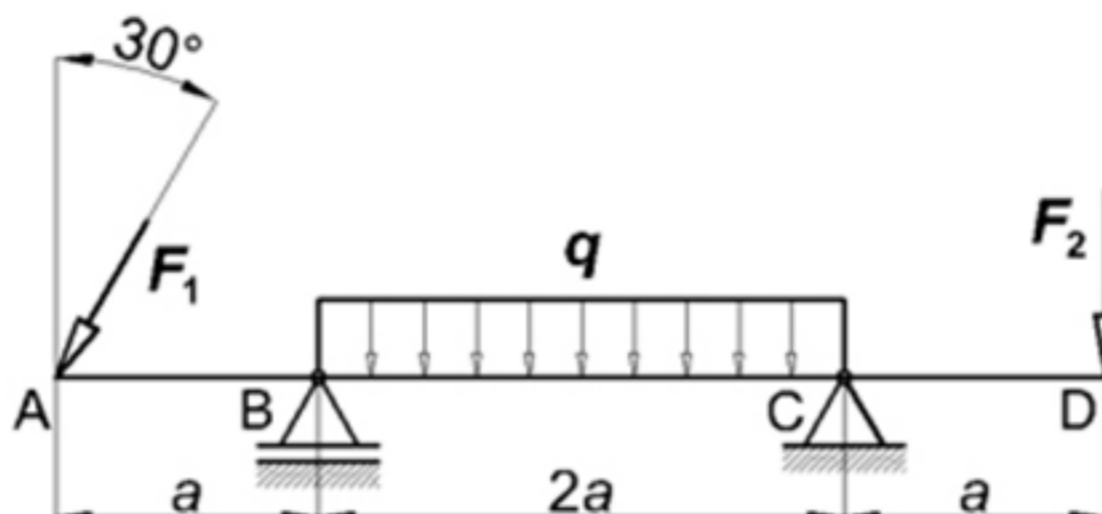
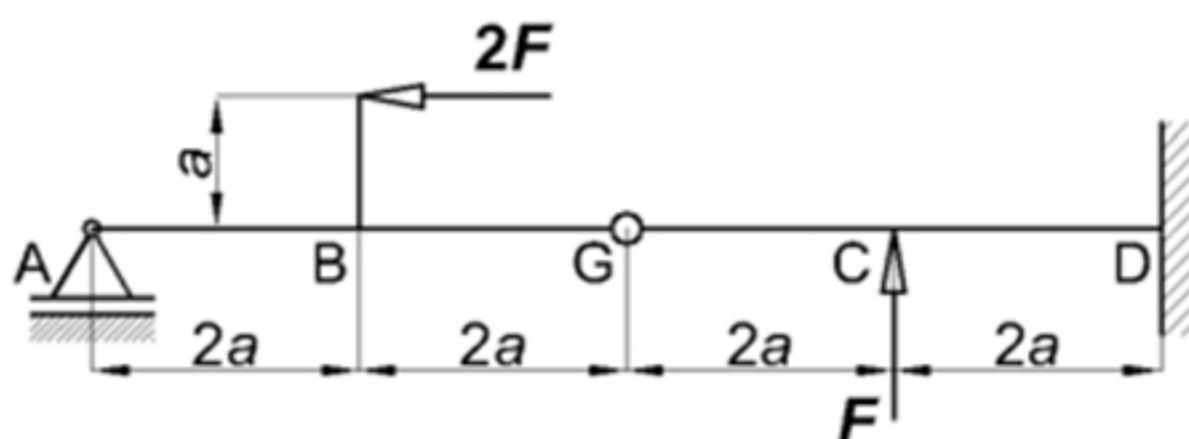


ДРУГИ КОЛОКВИЈУМ ИЗ ТЕХНИЧКЕ МЕХАНИКЕ I

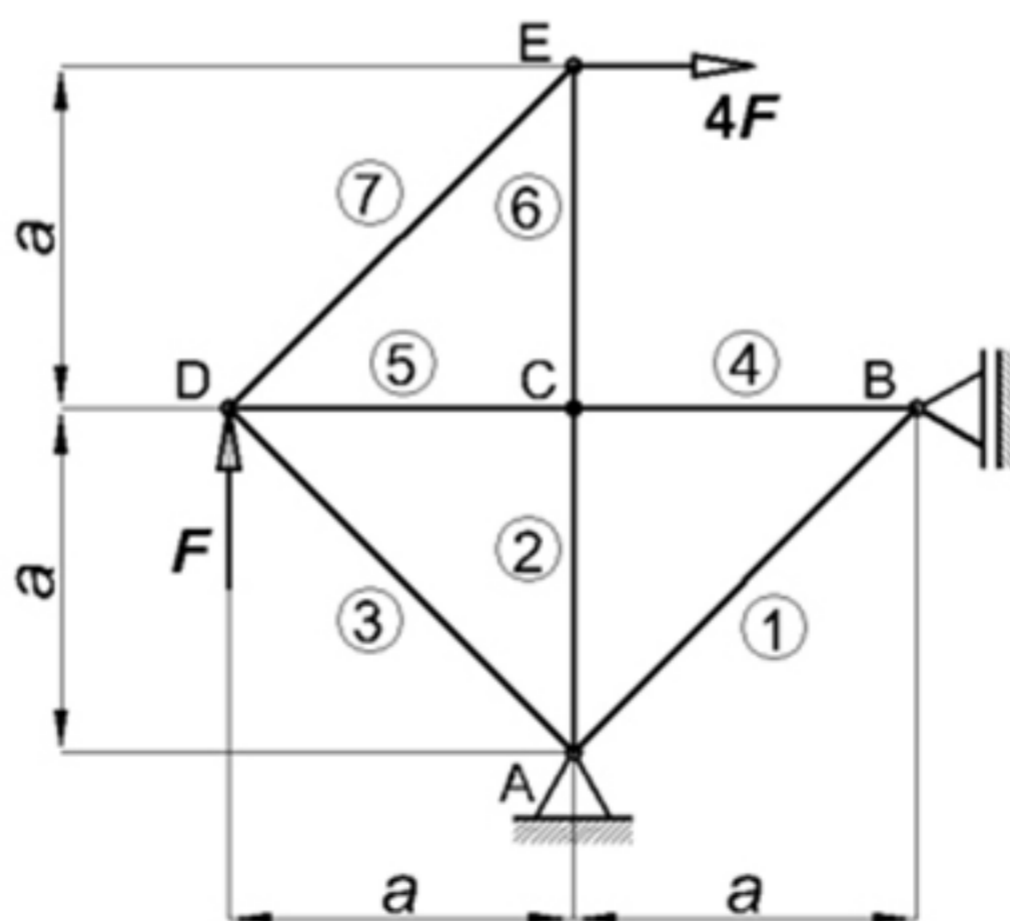
1. Одредити реакције веза носача приказаног на слици, а потом нацртати статичке дијаграме. Дато је: $F_1 = 4\sqrt{3}$ kN, $F_2 = 2$ kN, $q = 2$ kN/m и $a = 2$ m.



2. Одредити реакције веза Герберовог носача приказаног на слици, а потом нацртати статичке дијаграме. Дато је: $F = 6$ kN и $a = 1$ m.



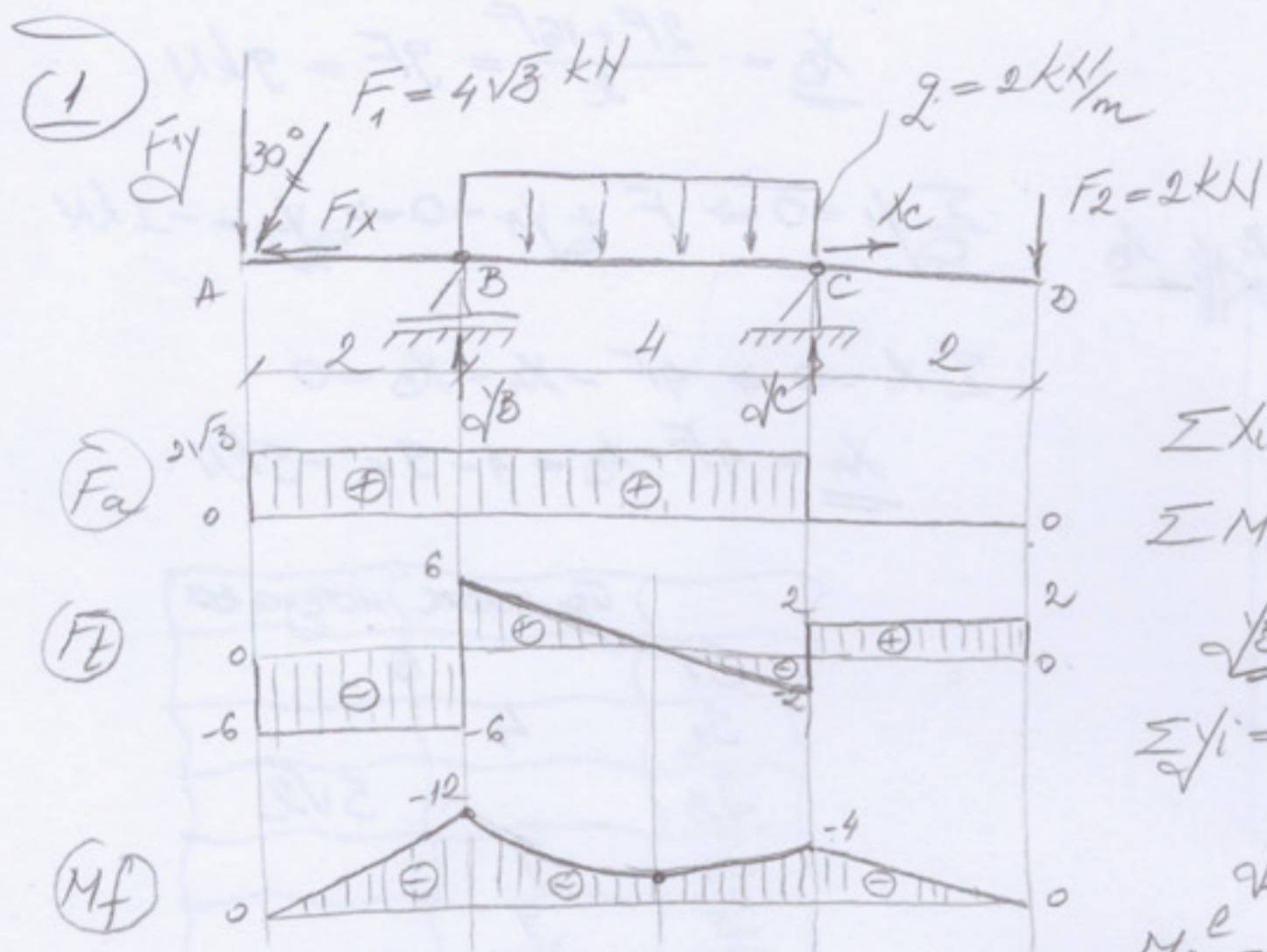
3. Одредити силе у штаповима решетке приказане на слици методом исијецања чворова и утврдити врсту оптерећења којем су штапови изложени. Потом провјерити добијене резултате Ритеровом методом за штапове 2, 3 и 4. Дато је: $F = 1$ kN и $a = 2$ m.



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$$F_{1x} = F_1 \sin 30^\circ = 2\sqrt{3} \text{ kN}$$

$$F_{1y} = F_1 \cos 30^\circ = 4\sqrt{3} \cdot \frac{\sqrt{3}}{2} = 6 \text{ kN}$$

$$Q = q \cdot 4 = 8 \text{ kN}$$

$$\sum X_i = 0 \Rightarrow -F_{1x} + X_C = 0 \Rightarrow X_C = 2\sqrt{3} \text{ kN}$$

$$\sum M_C = 0 \Rightarrow F_{1y} \cdot 6 - q_B \cdot 4 + Q \cdot 2 - F_2 \cdot 2 = 0$$

$$q_B = \frac{6F_{1y} + 2Q - 2F_2}{4} = \frac{6 \cdot 6 + 2 \cdot 8 - 2 \cdot 2}{4} = 12 \text{ kN}$$

$$\sum Y_i = 0 \Rightarrow -F_{1y} + q_B - Q + q_C - F_2 = 0$$

$$q_C = F_{1y} - q_B + Q + F_2 = 6 - 12 + 8 + 2 = 4 \text{ kN}$$

$$M_A^l = 0$$

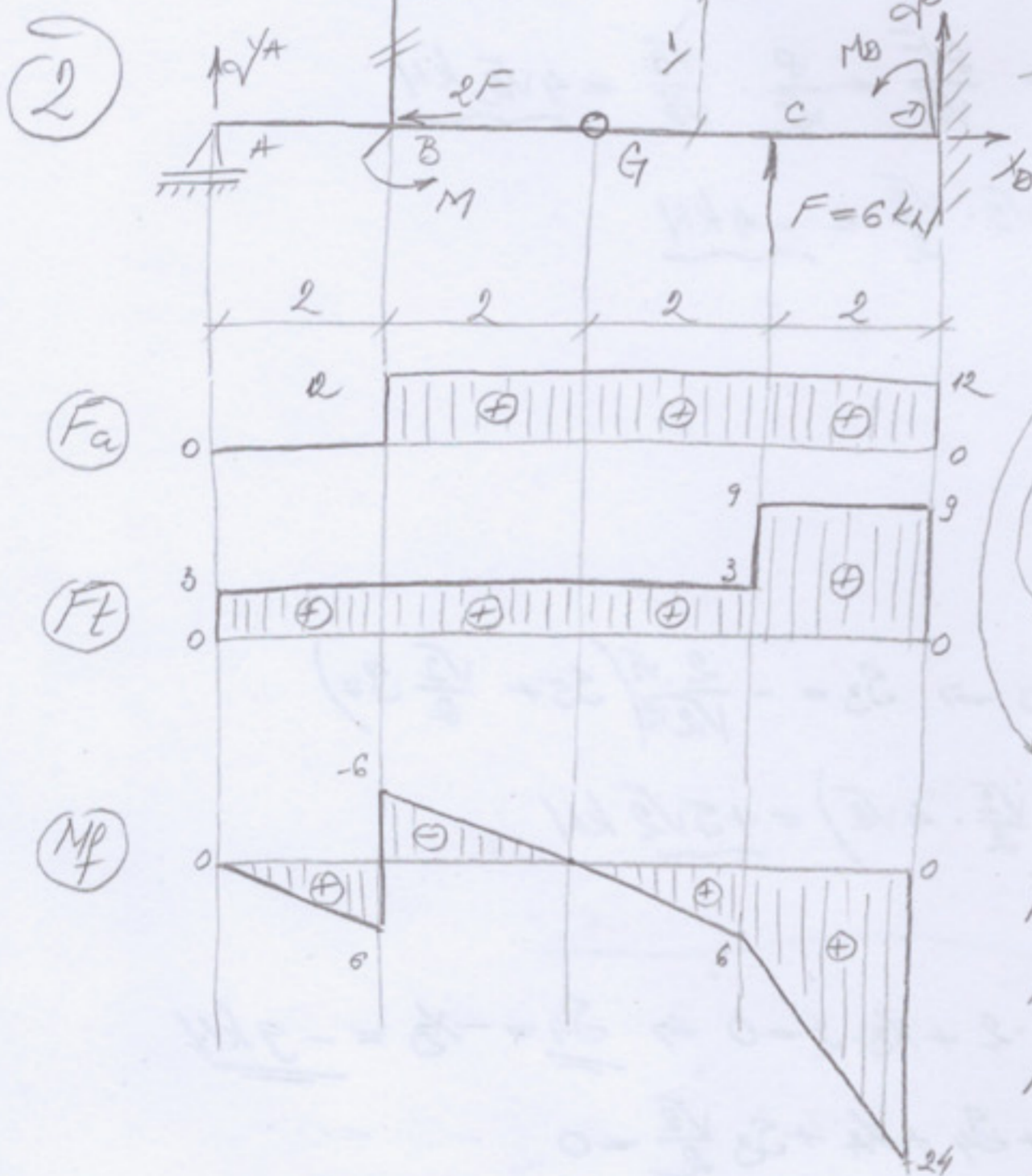
$$M_B^l = -F_{1y} \cdot 2 = -12 \text{ kNm}$$

$$M_B^d = -F_2 \cdot 6 + q_C \cdot 4 - Q \cdot 2 = -12 + 16 - 16 = -12 \text{ kNm}$$

$$M_C^d = -F_2 \cdot 2 = -4 \text{ kNm}$$

$$M_D^d = 0$$

$$2F = 12 \text{ kN}$$



$$M = 2F \cdot 1 = 12 \text{ kNm}$$

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

$$\sum Y_i = 0 \Rightarrow Y_A + F + Y_D = 0$$

$$\sum M_D = 0 \Rightarrow Y_A \cdot 8 - M + F \cdot 2 - M_D = 0$$

$$\sum M_G^l = 0 \Rightarrow Y_A \cdot 4 - M = 0 \Rightarrow Y_A = \frac{M}{4} = 3 \text{ kN}$$

$$M_D = 8Y_A - M + 2F = 8 \cdot 3 - 12 + 12 = 24 \text{ kNm}$$

$$q_{Y_D} = -Y_A - F = -3 - 6 = -9 \text{ kN}$$

$$M_A^l = 0$$

$$M_B^l = Y_A \cdot 2 = 6 \text{ kNm}$$

$$M_{BD}^l = Y_A \cdot 2 - M = 6 - 12 = -6 \text{ kNm}$$

$$M_{BD}^d = F \cdot 4 + q_{Y_D} \cdot 6 + M_D = 24 + (-54) + 24 = -6 \text{ kNm}$$

$$M_G = 0$$

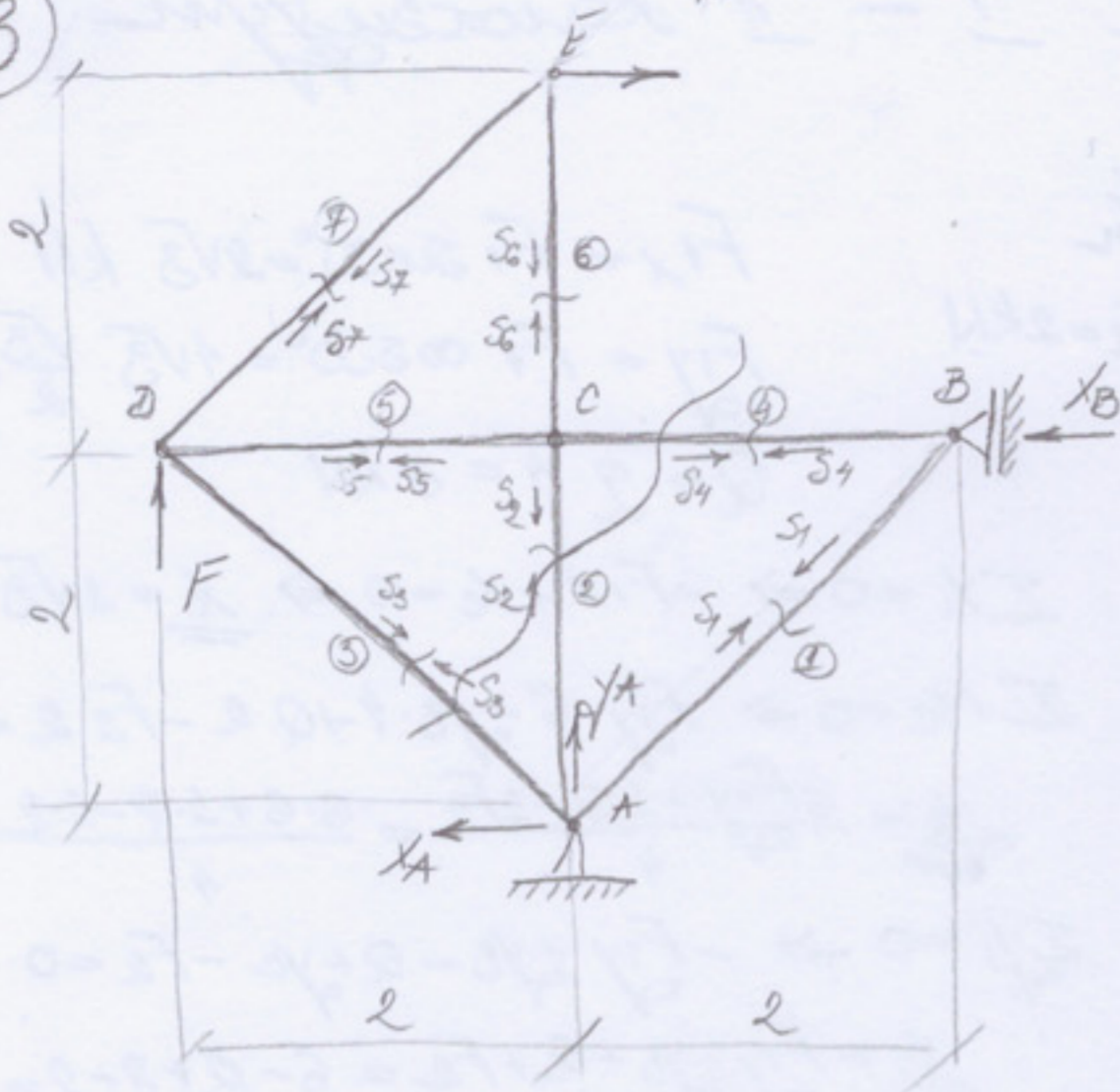
$$M_C^d = q_{Y_D} \cdot 2 + M_D = -18 + 24 = 6 \text{ kNm}$$

$$M_{DL}^d = M_D = 24 \text{ kNm}$$

$$M_{DD}^d = 0$$

3

$4F \quad F = 1 \text{ kN}$



$$\sum M_A = 0 \rightarrow F \cdot 2 + 4F \cdot 4 - X_B \cdot 2 = 0$$

$$X_B = \frac{2F + 16F}{2} = 9F = 9 \text{ kN}$$

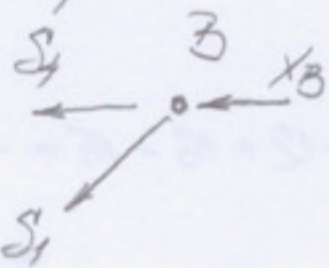
$$\sum Y_i = 0 \rightarrow F + Y_A = 0 \rightarrow Y_A = -1 \text{ kN}$$

$$\sum X_i = 0 \rightarrow 4F - X_A - X_B = 0$$

$$X_A = 4F - X_B = 4 - 9 = -5 \text{ kN}$$

| | внутренние | внешние |
|-------|------------|-------------|
| S_1 | | 0 |
| S_2 | 4 | |
| S_3 | | $5\sqrt{2}$ |
| S_4 | 9 | |
| S_5 | 9 | |
| S_6 | 4 | |
| S_7 | | $4\sqrt{2}$ |

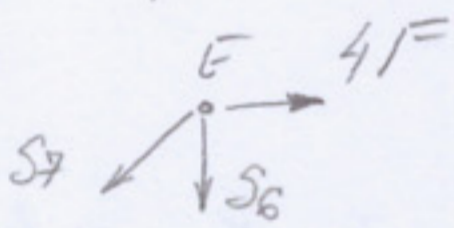
в опор B



$$S_1 \cdot \frac{\sqrt{2}}{2} = 0 \Rightarrow S_1 = 0$$

$$X_B + S_4 + S_1 \cdot \frac{\sqrt{2}}{2} = 0 \Rightarrow S_4 = -X_B = -9 \text{ kN}$$

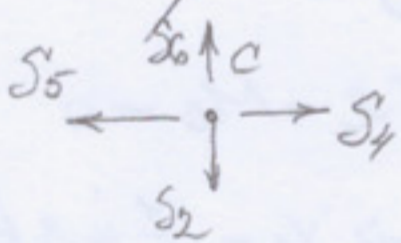
в опор E



$$S_7 \cdot \frac{\sqrt{2}}{2} = 4F \Rightarrow S_7 = \frac{8F}{\sqrt{2}} = \frac{8}{\sqrt{2}} \cdot \frac{\sqrt{2}}{\sqrt{2}} = 4\sqrt{2} \text{ kN}$$

$$S_6 = -S_7 \cdot \frac{\sqrt{2}}{2} = -4\sqrt{2} \cdot \frac{\sqrt{2}}{2} = -4 \text{ kN}$$

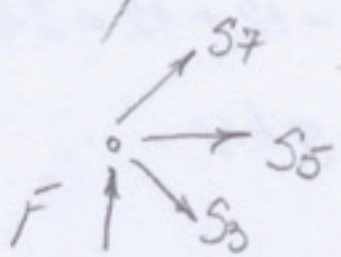
в опор C



$$S_5 = S_4 = -9 \text{ kN}$$

$$S_2 = S_6 = -4 \text{ kN}$$

в опор D



$$S_5 + S_7 \cdot \frac{\sqrt{2}}{2} + S_3 \cdot \frac{\sqrt{2}}{2} = 0 \Rightarrow S_3 = -\frac{2 \cdot \sqrt{2}}{\sqrt{2} \cdot \sqrt{2}} (S_5 + \frac{\sqrt{2}}{2} S_7)$$

$$S_3 = -\sqrt{2} (-9 + \frac{\sqrt{2}}{2} \cdot 4\sqrt{2}) = 5\sqrt{2} \text{ kN}$$

$$\sum M_A = 0 \Rightarrow S_4 \cdot 2 + X_B \cdot 2 = 0 \Rightarrow S_4 = -X_B = -9 \text{ kN}$$

$$\sum X_i = 0 \Rightarrow X_B + S_4 + X_A + S_3 \cdot \frac{\sqrt{2}}{2} = 0$$

$$S_3 = -\sqrt{2} (X_B + S_4 + X_A) = -\sqrt{2} (9 - 9 - 5) = 5\sqrt{2} \text{ kN}$$

$$\sum Y_i = 0 \Rightarrow S_2 + Y_A + S_3 \cdot \frac{\sqrt{2}}{2} = 0$$

$$S_2 = -Y_A - \frac{\sqrt{2}}{2} S_3 = +1 - \frac{\sqrt{2}}{2} \cdot 5\sqrt{2} = -4 \text{ kN}$$

