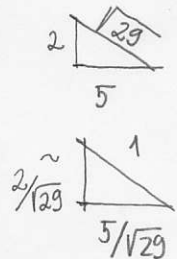
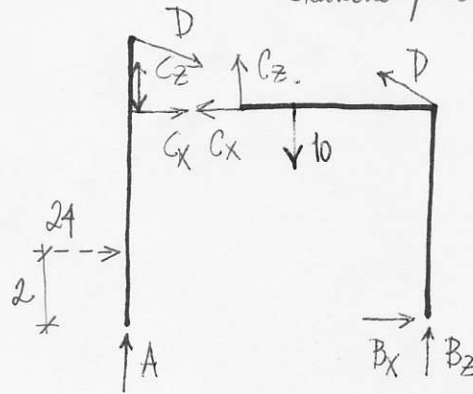
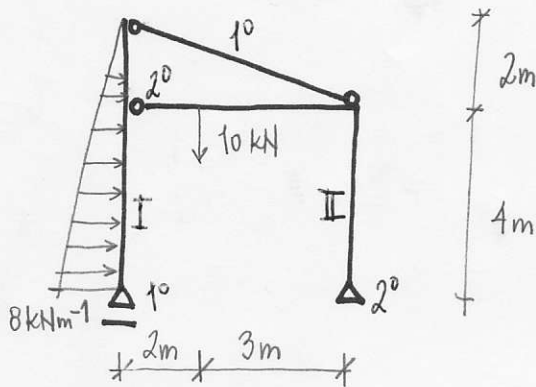


Pr. 1 Uřešte všechny vnitřní a vnější reakce složené soustavy. Proveďte kontrolu a vyznačte skutečně působení reakcí.



$$m = 2 \cdot 3 = 6$$

$$r = 1 + 2 + 1 + 2 = 6$$

$$S = m - r = 0 \checkmark$$

$$I + II : \rightarrow : 24 + B_x = 0 \Rightarrow B_x = -24 \text{ kN}$$

$$\curvearrowleft : 5B_z - 2 \cdot 10 - 24 \cdot 2 = 0 \Rightarrow B_z = \frac{68}{5} = 13,6 \text{ kN}$$

$$\uparrow : A + B_z - 10 = 0 \Rightarrow A = -3,6 \text{ kN}$$

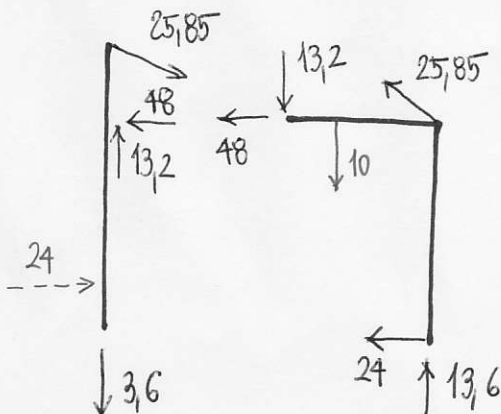
$$I : \curvearrowleft : 24 \cdot 2 - 2 \cdot D \cdot \frac{5}{\sqrt{29}} = 0 \Rightarrow D = \sqrt{29} \cdot \frac{48}{10} = 25,85 \text{ kN}$$

$$\rightarrow : C_x + D \cdot \frac{5}{\sqrt{29}} + 24 = 0 \Rightarrow C_x = -\frac{5}{\sqrt{29}} \cdot \sqrt{29} \cdot \frac{48}{10} - 24 = 48 \text{ kN}$$

$$\uparrow : A - D \cdot \frac{2}{\sqrt{29}} - C_z = 0 \Rightarrow C_z = -3,6 - \sqrt{29} \cdot \frac{48}{10} \cdot \frac{2}{\sqrt{29}} = -13,2 \text{ kN}$$

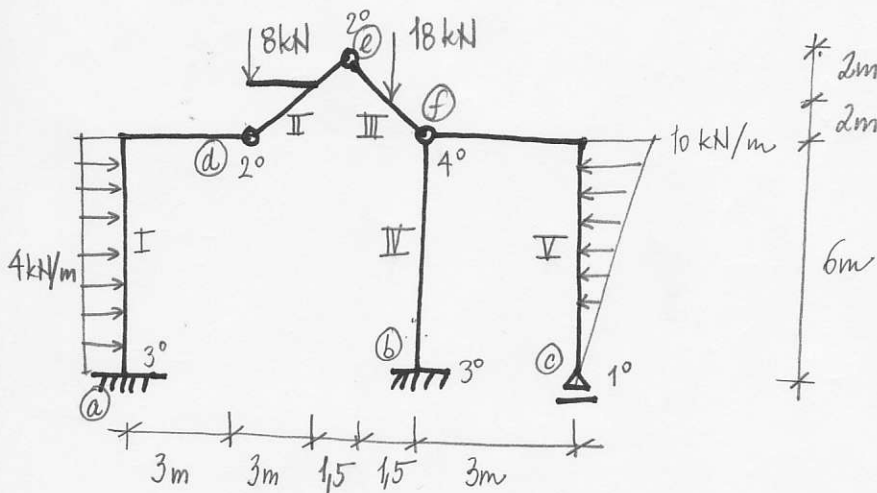
$$\text{Kontrola : II : } \curvearrowleft : -2 \cdot 10 + D \cdot \frac{2}{\sqrt{29}} \cdot 5 + B_x \cdot 4 + B_z \cdot 5 =$$

$$-20 + \sqrt{29} \cdot \frac{48}{10} \cdot \frac{10}{\sqrt{29}} - 96 + 68 = 0 \checkmark$$



Pr. 2 Určete všechny měřít a vnitřní reakce dané složené soustavy.

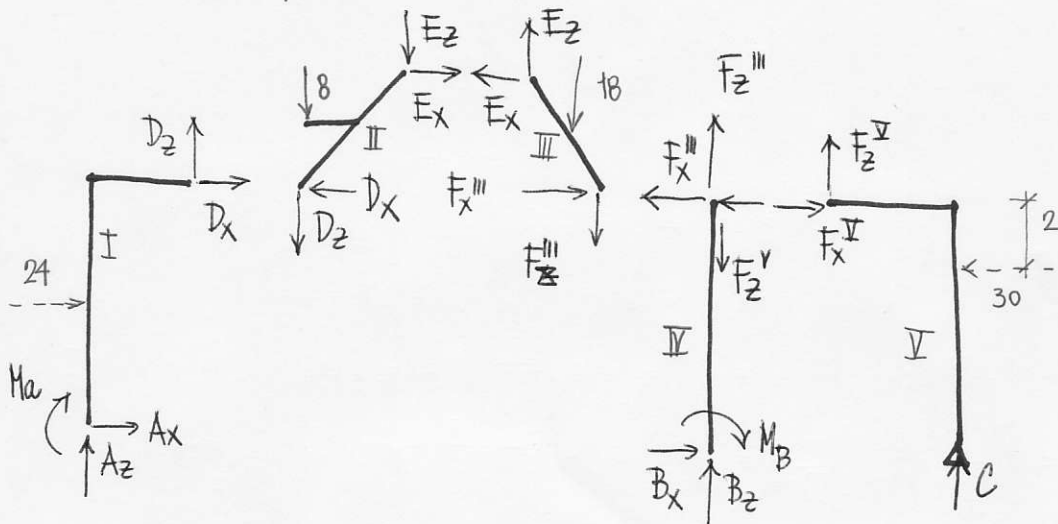
2/2



$$m = 5 \cdot 3 = 15$$

$$r = 3 + 2 + 2 + 4 + 3 + 1 = 15$$

$$s = m - r = 0 \checkmark$$



$$\text{IV: } \rightarrow : F_x^V - 30 = 0 \Rightarrow F_x^V = 30 \text{ kN (1)}$$

$$\curvearrowleft : 3C - 30 \cdot 2 = 0 \Rightarrow C = 20 \text{ kN (2)}$$

$$\uparrow : F_z^V + C = 0 \Rightarrow F_z^V = -20 \text{ kN (3)}$$

$$\text{II + III: } \curvearrowleft : -F_z^{\text{III}} \cdot 6 - 18 \cdot 4,5 = 0 \Rightarrow F_z^{\text{III}} = -13,5 \text{ kN (4)}$$

$$\uparrow : -D_z - 8 - 18 - F_z^{\text{III}} = 0 \Rightarrow D_z = -12,5 \text{ kN (5)}$$

$$\text{II: } \uparrow : -D_z - 8 - E_z = 0 \Rightarrow E_z = 4,5 \text{ kN (6)}$$

$$\curvearrowleft : -4E_x - 3E_z = 0 \Rightarrow E_x = -3,375 \text{ kN (7)}$$

$$\rightarrow : -D_x + E_x = 0 \Rightarrow D_x = -3,375 \text{ kN (8)}$$

$$\text{I: } \rightarrow : A_x + 24 + D_x = 0 \Rightarrow A_x = -20,625 \text{ kN (9)}$$

$$\uparrow : A_z + D_z = 0 \Rightarrow A_z = 12,5 \text{ kN (10)}$$

$$\curvearrowleft : -M^a - 24 \cdot 3 + 3D_z - 6 \cdot D_x = 0 \Rightarrow M^a = -89,25 \text{ kNm (11)}$$

$$\text{III: } \rightarrow : -E_x + F_x^{\text{III}} = 0 \Rightarrow F_x^{\text{III}} = -3,375 \text{ kN (12)}$$

$$\text{IV: } \rightarrow : B_x - F_x^{\text{III}} - F_x^{\text{IV}} = 0 \Rightarrow B_x = -26,625 \text{ kN (13)}$$

$$\uparrow : B_z + F_z^{\text{III}} - F_z^{\text{IV}} = 0 \Rightarrow B_z = -6,5 \text{ kN (14)}$$

$$\curvearrowleft : 6B_x - M_B = 0 \Rightarrow M_B = -159,75 \text{ kNm (15)}$$