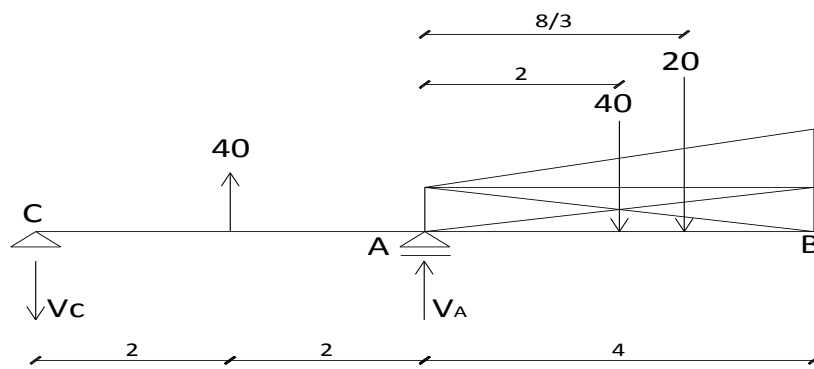
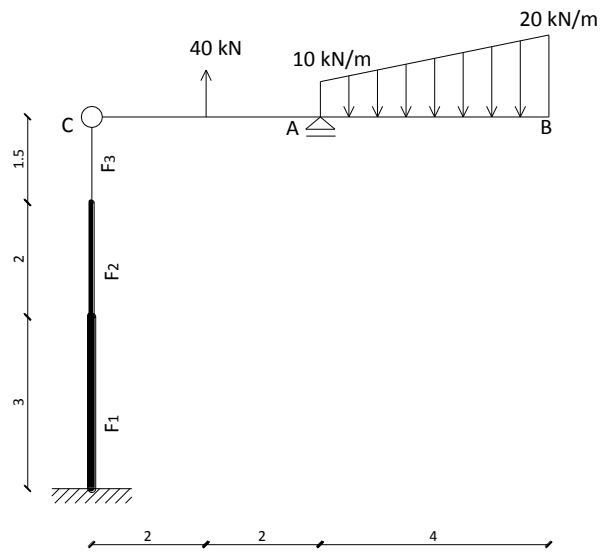


1. Odrediti vertikalno pomeranje tačke B, ako je poznato: $F_1=25\text{ cm}^2$, $F_2=15\text{ cm}^2$, $F_3=10\text{ cm}^2$, $E=200\text{ GPa}$, štap C-B je beskonačno krut



$$\sum M_C = 0$$

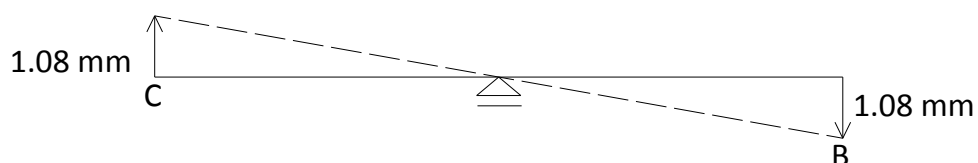
$$40 \cdot 2 + V_A \cdot 4 - 40 \cdot 6 - 20 \cdot \frac{20}{3} = 0$$

$$V_A = 73.33\text{ kN}$$

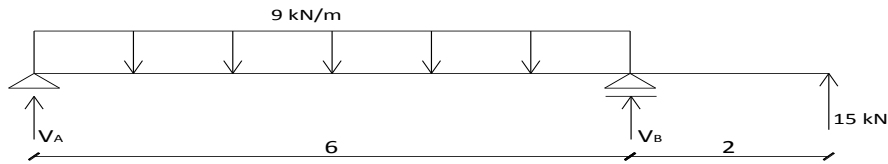
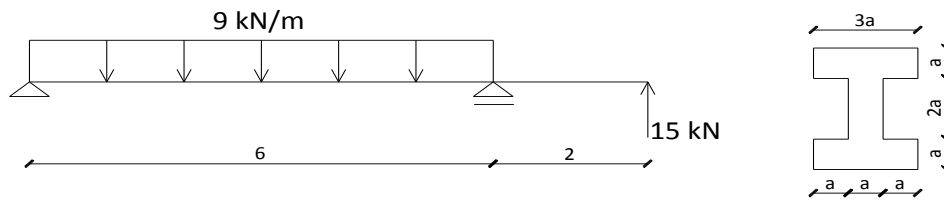
$$\sum V_i = 0 \rightarrow V_C = 53.33\text{ kN}$$

$$\Delta l = \frac{S_1 \cdot l_1}{E \cdot F_1} + \frac{S_2 \cdot l_2}{E \cdot F_2} + \frac{S_3 \cdot l_3}{E \cdot F_3} = \frac{53.33 \cdot 300}{20000 \cdot 25} + \frac{53.33 \cdot 200}{20000 \cdot 15} + \frac{53.33 \cdot 150}{20000 \cdot 10} = 0.108\text{ cm} = 1.08\text{ mm}$$

Iz uslova proporcionalnosti nalazimo vertikalno pomeranje tačke B

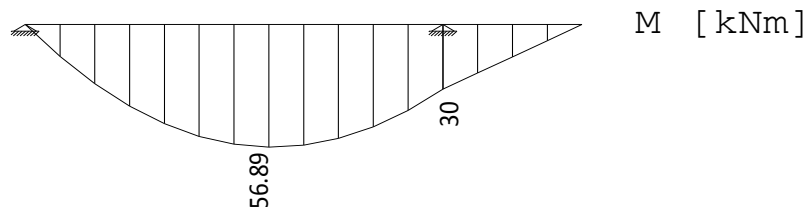
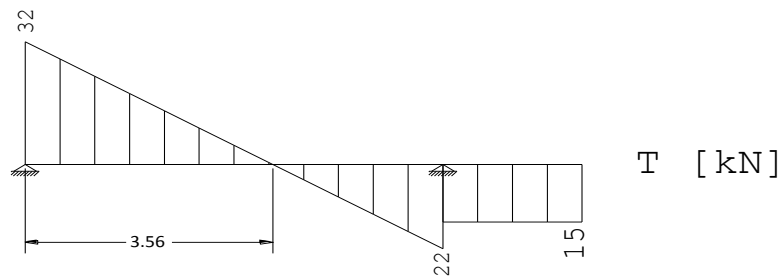


2. Odrediti dimenzije grede ako je dozvoljeni napon na savijanje $\sigma_{dop} = 16 \text{ kN/cm}^2$



$$\sum MA = 0 \rightarrow -9 \cdot 6 \cdot 3 + VB \cdot 6 + 15 \cdot 8 = 0 \rightarrow VB = 7 \text{ kN}$$

$$\sum Vi = 0 \rightarrow VA = 32 \text{ kN}$$



$$M_{max} = 56.89 \text{ kNm}$$

$$\sigma = \frac{M}{W_x} \rightarrow W_{pot} = \frac{M}{\sigma_{dop}} = \frac{56,89 \cdot 100}{16} = 355,56 \text{ cm}^3$$

$$T1(0;1.5a) \quad A1 = 3a^2$$

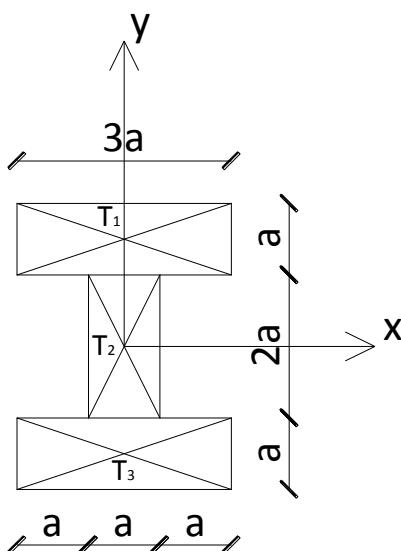
$$T2(0,0) \quad A2 = 2a^2$$

$$T3(0;-1.5a) \quad A1 = 3a^2$$

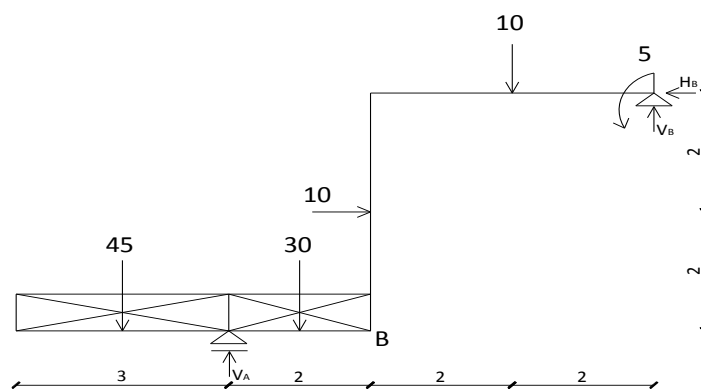
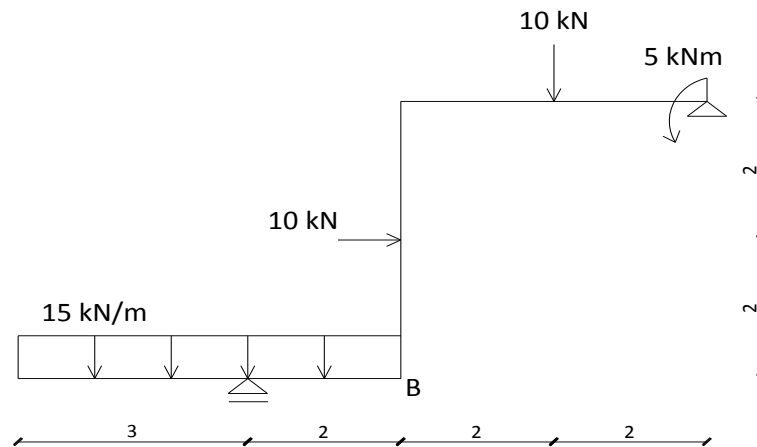
$$I_x = 2 \cdot \left(\frac{3a \cdot a^3}{12} + 3a^2 \cdot (1,5a - 0)^2 \right) + \frac{a \cdot 2a^3}{12} = 14.67 a^4$$

$$W_x = \frac{I_x}{Y_{max}} \rightarrow 355,56 = \frac{14.67 a^4}{2a} \rightarrow 355,56 = 7,335 a^3$$

$$a = \sqrt[3]{48,47} = 3,65 \rightarrow \text{Usvojeno } a = 4,0 \text{ cm}$$



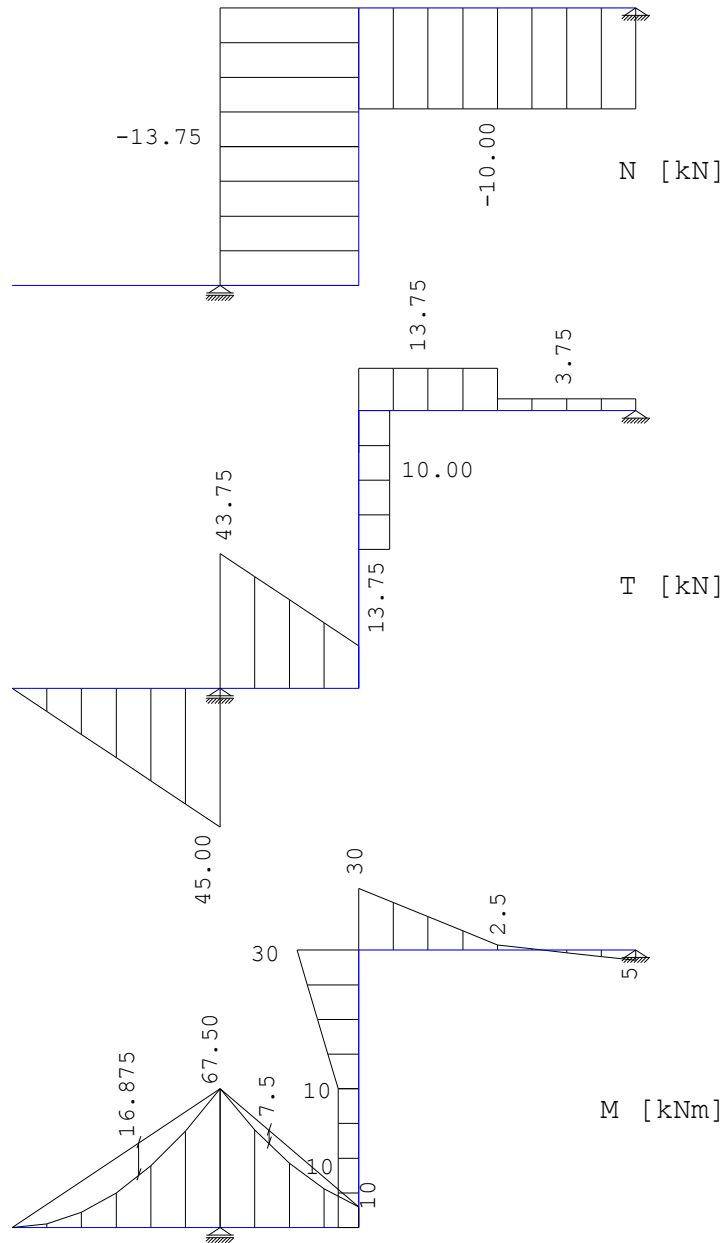
3. Odrediti obrtanje tačke B $E=210 \text{ GPa}$, $I= 4000 \text{ cm}^4$



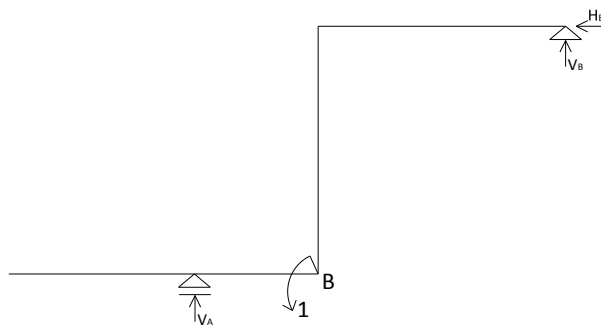
$$\sum MB = 0 \rightarrow -45 \cdot 7.5 - 30 \cdot 5 - 10 \cdot 2 - 10 \cdot 2 - 5 + V_A \cdot 6 = 0 \rightarrow V_A = 88.75 \text{ kN}$$

$$\sum Vi = 0 \rightarrow V_B = -3.75 \text{ kN}$$

$$\sum Hi = 0 \rightarrow H_B = 10 \text{ kN}$$



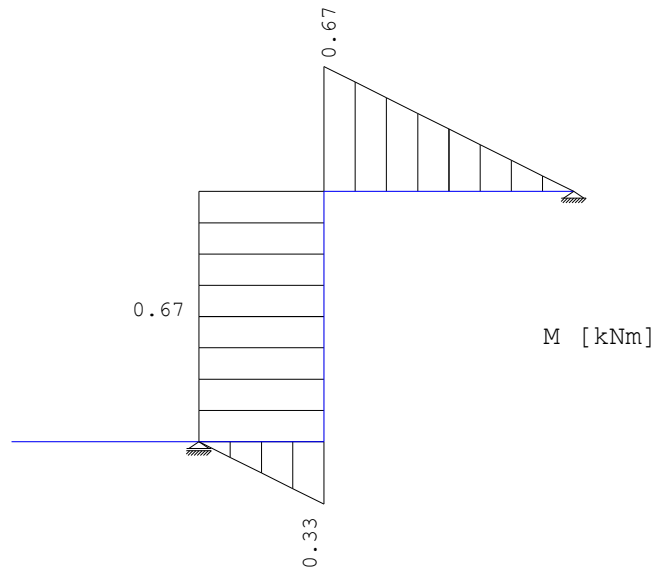
- obrtanje take B



$$V_A = 0,17 \text{ kN}$$

$$V_B = -0,17 \text{ kN}$$

$$H_B = 0 \text{ kN}$$



$$\begin{aligned}
 \varphi_B &= \frac{1}{EI} \int_0^l M \cdot M_2 dl \\
 &= \frac{1}{EI} \left(-\frac{2}{6} \cdot 0,33 \cdot (2 \cdot 10 + 67,5) + \frac{2}{3} \cdot 7,5 \cdot 0,33 + 10 \cdot 0,67 + 0,67 \cdot (10 + 30) \right. \\
 &\quad \left. + \frac{2}{6} \cdot (30 \cdot (2 \cdot 0,67 + 0,33) + 2,5 \cdot (0,67 + 2 \cdot 0,33)) + \frac{2}{6} \cdot 0,33 \cdot (2 \cdot 2,5 - 5) \right) \\
 &= \frac{43,33}{210 \cdot 10^6 \cdot 4000 \cdot 10^{-8}} = 5,0 \cdot 10^{-3} \text{ rad}
 \end{aligned}$$