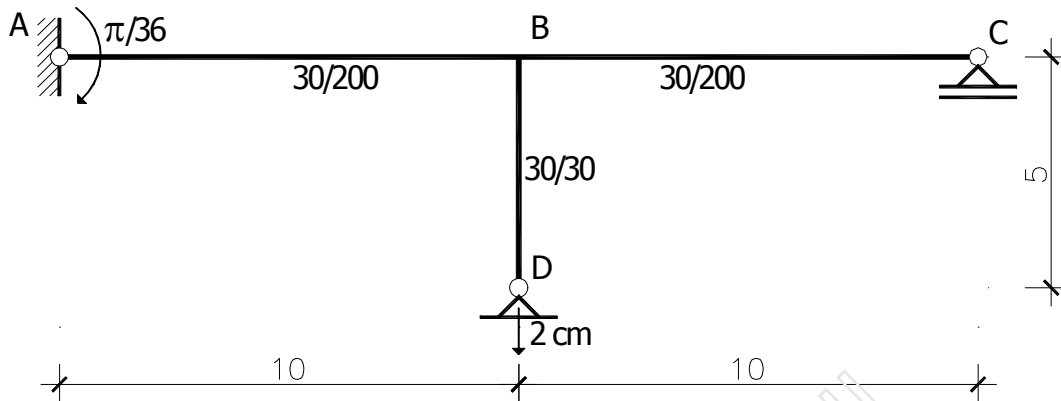


1.2. Metodom sila riješiti dati nosač zanemarujući uticaj normalnih sila kod proračuna pomjeranja. Nacrtati dijagrame M, T i N. ( $E_{const.} = 3 \cdot 10^7 \text{ kN/m}^2$ )



Odredimo stupanj statičke neodređenosti sustava i momente inercije:

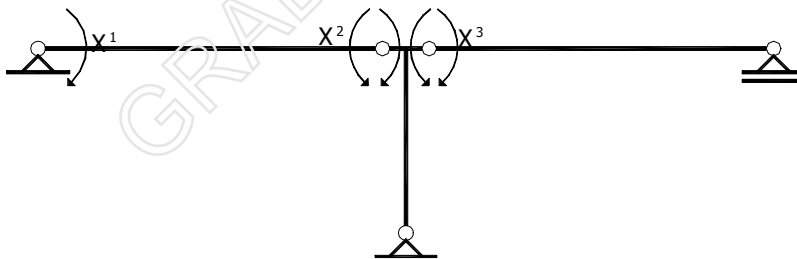
$$SSK = 2 \cdot 4 - (3 + 2 + 6) = 8 - 11 = -3 \Rightarrow SSN = 3$$

$$I_c = I_G = \frac{0,3 \cdot 2^3}{12} = 0,2 \text{ m}^4$$

$$I_s = \frac{0,3^4}{12} = 0,000675 \text{ m}^4$$

$$\frac{I_c}{I_s} = \left( \frac{2}{0,3} \right)^3 = 296,296$$

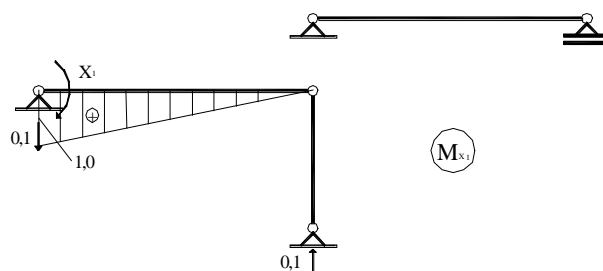
Formirajmo slijedeći osnovni sustav:

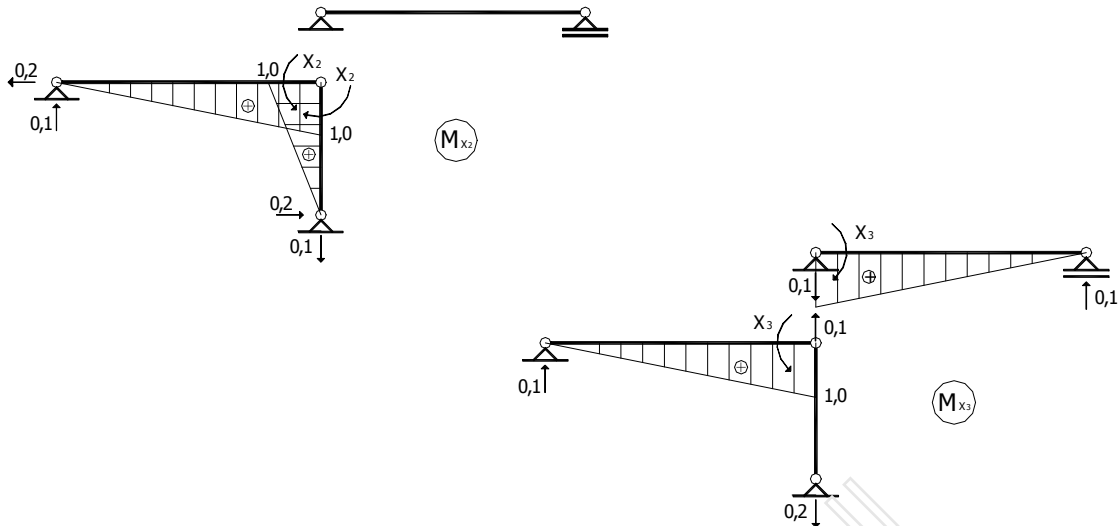


Momentni dijagrami od jediničnih momenata

$$X_i = 1,0 \text{ kNm}, \quad i=1,2,3$$

su:





Izračunajmo koeficijente potrebne za formiranje sustava jednažbi elastičnosti.

$$E \cdot I_C \cdot \delta_{11} = \frac{1,0 \cdot 10}{2} \cdot \frac{2}{3} \cdot 1 = 3,333$$

$$E \cdot I_C \cdot \delta_{22} = \frac{1,0 \cdot 10}{2} \cdot \frac{2}{3} \cdot 1 + \frac{1,0 \cdot 5}{2} \cdot \frac{2}{3} \cdot 1 \cdot 296,296 = 497,160$$

$$E \cdot I_C \cdot \delta_{33} = \frac{1,0 \cdot 10}{2} \cdot \frac{2}{3} \cdot 1 \cdot 2 = 6,667$$

$$E \cdot I_C \cdot \delta_{12} = \frac{1,0 \cdot 10}{2} \cdot \frac{1}{3} \cdot 1 = 1,667$$

$$E \cdot I_C \cdot \delta_{13} = \frac{1,0 \cdot 10}{2} \cdot \frac{1}{3} \cdot 1 = 1,667$$

$$E \cdot I_C \cdot \delta_{23} = \frac{1,0 \cdot 10}{2} \cdot \frac{2}{3} \cdot 1 = 3,333$$

$$E \cdot I_C \cdot \Delta_{1s} = \left( 1,0 \cdot \frac{\pi}{36} - 0,1 \cdot 0,02 \right) \cdot 3 \cdot 10^7 \cdot 0,2 = 511598,78$$

$$E \cdot I_C \cdot \Delta_{2s} = (0,1 \cdot 0,02) \cdot 3 \cdot 10^7 \cdot 0,2 = 12000$$

$$E \cdot I_C \cdot \Delta_{3s} = (0,2 \cdot 0,02) \cdot 3 \cdot 10^7 \cdot 0,2 = 24000$$

Sustav jednažbi elastičnosti glasi:

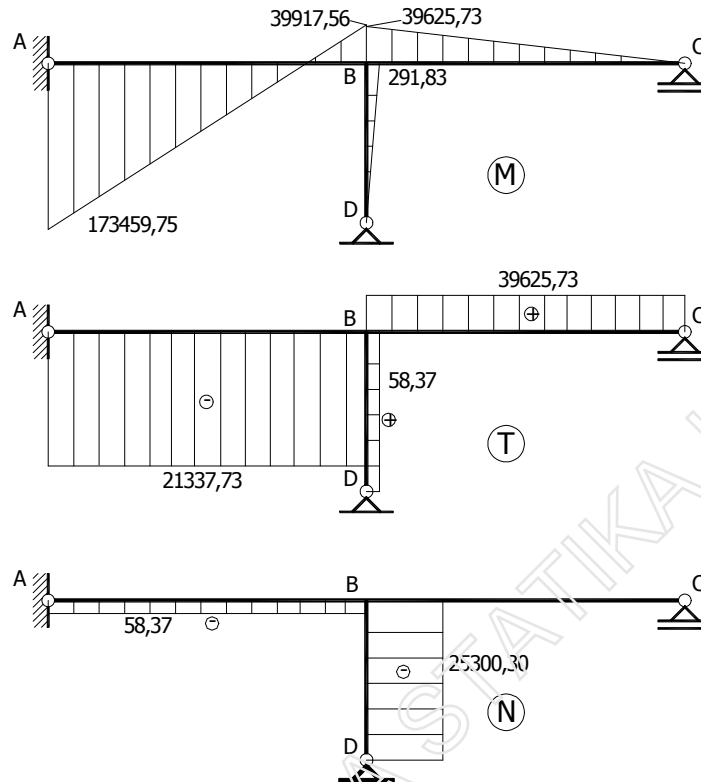
$$\begin{aligned} 3,333 \cdot X_1 + 1,667 \cdot X_2 + 1,667 \cdot X_3 &= 511598,78 \\ 1,667 \cdot X_1 + 497,160 \cdot X_2 + 3,333 \cdot X_3 &= 12000,00 \\ 1,667 \cdot X_1 + 3,333 \cdot X_2 + 6,667 \cdot X_3 &= 24000,00 \end{aligned}$$

Čije je rješenje:

$$\begin{aligned} X_1 &= 173459,75 \text{ [kNm]}, \\ X_2 &= -291,83 \text{ [kNm]}, \\ X_3 &= -39625,73 \text{ [kNm]}. \end{aligned}$$



Vrijednosti momenata, transverzalnih i normalnih sila u pojedinim presjecima računamo prema formulama danim u prethodnom zadatku, te na osnovu njih dobivamo dijagrame:



*M, T i N dijagrami*