

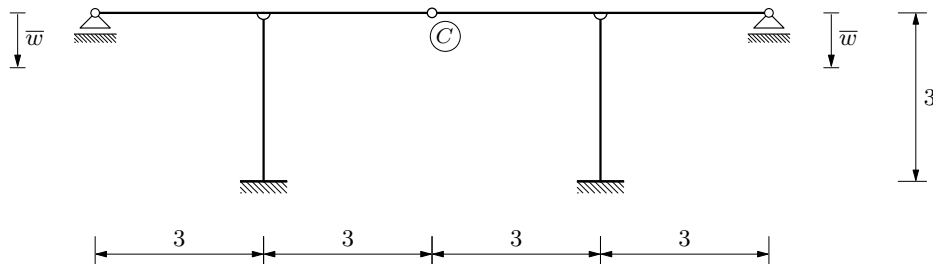
# GS 1. — 17. lipnja 2024.

## Zadatak 2.

- a. Metodom sila izračunajte potrebne vrijednosti i nacrtajte dijagrame unutarnjih sila!
- b. Izračunajte orijentiranu duljinu pomaka točke  $C$ !

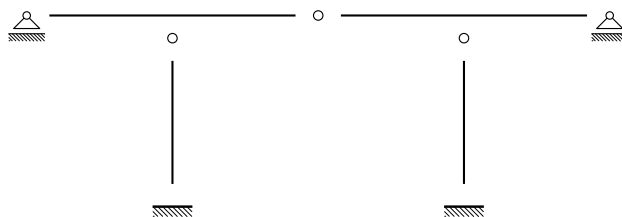
$$\bar{w} = 3,25 \text{ mm}$$

$$EI = 162000 \text{ kNm}^2$$



Korak prvi. Stupanj statičke neodređenosti  $\mathcal{E}$  osnovni sistem (za metodu sila).

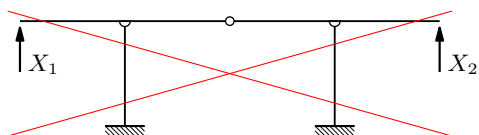
(podrobnije u odjeljku *Korak prvi primjera Metoda sila (Ispitni rok 6. rujna 2022., zadatak 3.)* (<http://master.grad.hr/nastava/gs/g1/isp/1-220906-3.pdf>) na stranici *Bilješke i skice s predavanja* (<http://master.grad.hr/nastava/gs/g1/>))



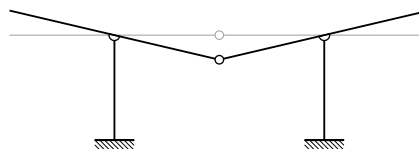
$$S_{\min} = 3t - 2z_1 - \ell = 3 \cdot 4 - 2 \cdot 3 - (1 \cdot 2 + 3 \cdot 2) = -2$$

nije osnovni sistem

(koliko god izgledao privlačno  
za zadane prisilne pomake):

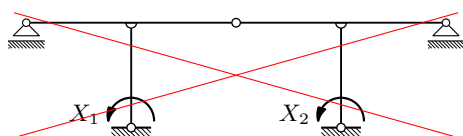


nego mehanizam:

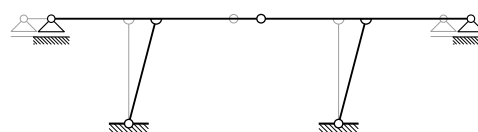


nije osnovni sistem

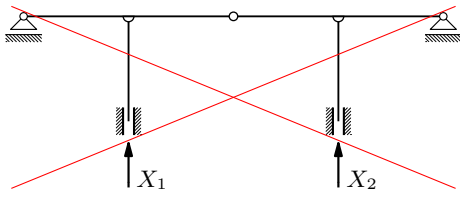
(iako je privlačan za prisilne zaokrete ležajeva  
stupova (kao u zadatku na 2. kolokviju)):



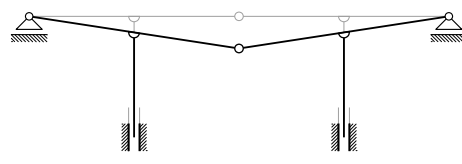
nego mehanizam:



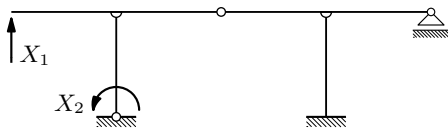
nije osnovni sistem:



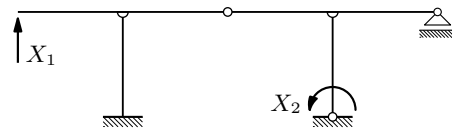
nego mehanizam:



osnovni sistem:



drugi osnovni sistem:



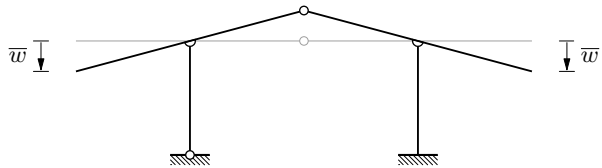
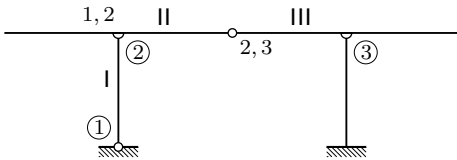
Korak drugi. Sustav jednadžbi kompatibilnosti (za prvi osnovni sistem) i njegovo rješenje.

$$\delta_{1,1} X_1 + \delta_{1,2} X_2 + \delta_{1,0} = \bar{\delta}_1$$

$$\delta_{2,1} X_1 + \delta_{2,2} X_2 + \delta_{2,0} = \bar{\delta}_2$$

$$\bar{\delta}_1 = -\bar{w} \quad \dots \text{ jer je prisilni pomak na mjestu i na pravcu raskinute veze,} \\ \text{ ali je suprotnoga smisla}$$

$$\bar{\delta}_2 = 0 \quad \dots \text{ jer na mjestu raskinute veze nema prisilnoga pomaka}$$



$$\delta_{1,0} = \bar{\delta}_{1,0} = -\bar{w} \quad \dots \text{ prema planu pomakā}$$

$$\delta_{2,0} = \bar{\delta}_{2,0} = 0 \quad \dots \text{ prema planu pomakā}$$

$$\delta_{1,1} X_1 + \delta_{1,2} X_2 - \bar{w} = -\bar{w}$$

$$\delta_{2,1} X_1 + \delta_{2,2} X_2 + 0 = 0$$

$$\delta_{1,1} X_1 + \delta_{1,2} X_2 = -\bar{w} + \bar{w}$$

$$\delta_{2,1} X_1 + \delta_{2,2} X_2 = 0$$

$$\delta_{1,1} X_1 + \delta_{1,2} X_2 = 0$$

$$\delta_{2,1} X_1 + \delta_{2,2} X_2 = 0$$

sustav jednadžbi je homogen

regularni homogeni sustav jednadžbi ima jedinstveno rješenje  $X_1 = 0 \ \& \ X_2 = 0$

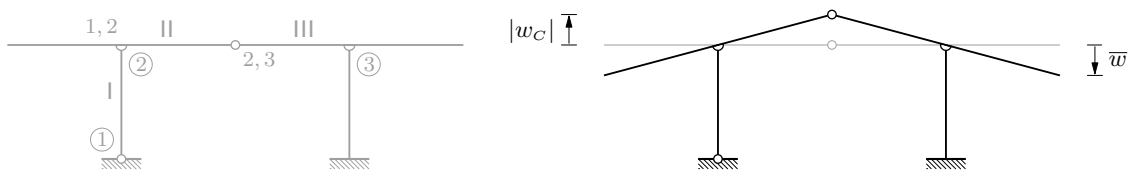
Korak treći. Unutarnje sile.

$$M(x) = X_1 m_1(x) + X_2 m_2(x) = 0 \cdot m_1(x) + 0 \cdot m_2(x) \Rightarrow M \equiv 0$$

iz  $T(x) = M'(x)$  i  $M \equiv 0$  slijedi  $T \equiv 0$

iz  $T \equiv 0$  i uvjetā ravnoteže slijedi  $N \equiv 0$

Korak četvrti. Orijehtirana duljina pomaka točke  $C$ .



(redukcijski stavak — bilo koji osnovni sistem)

$$|w_C| = \bar{w} = 3,25 \text{ mm}$$

$$w_C = -3,25 \text{ mm}$$