

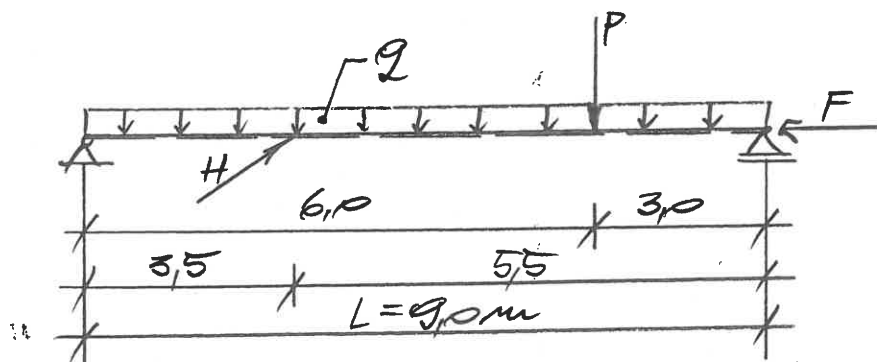
2. KOLOKVIJ - JEKLENE KONSTRUKCIJE

Kandidat:

Naloga:

Medetažni nosilec dolžine $L=9$ m iz valjanega prereza HEA 500 in materiala S 355 je obremenjen z zvezno obtežbo $q=20$ kN/m (stalna obtežba), z navpično silo $P=100$ kN (koristna obtežba), z bočno vodoravno silo $H=5$ kN (veter) in z vzdolžno vodoravno silo $F=100$ kN (veter). Lastno težo nosilca zanemari. V kombinaciji obtežb upoštevaj koristno obtežbo kot dominantni spremenljivi vpliv.

- Po mejnem stanju nosilnosti dimenzioniraj nosilec, ki je bočno podprt samo na obeh svojih podporah. Nariši diagrame notranjih statičnih količin.
- Po mejnem stanju uporabnosti preveri vertikalno deformacijo za koristno obtežbo v sredini nosilca.



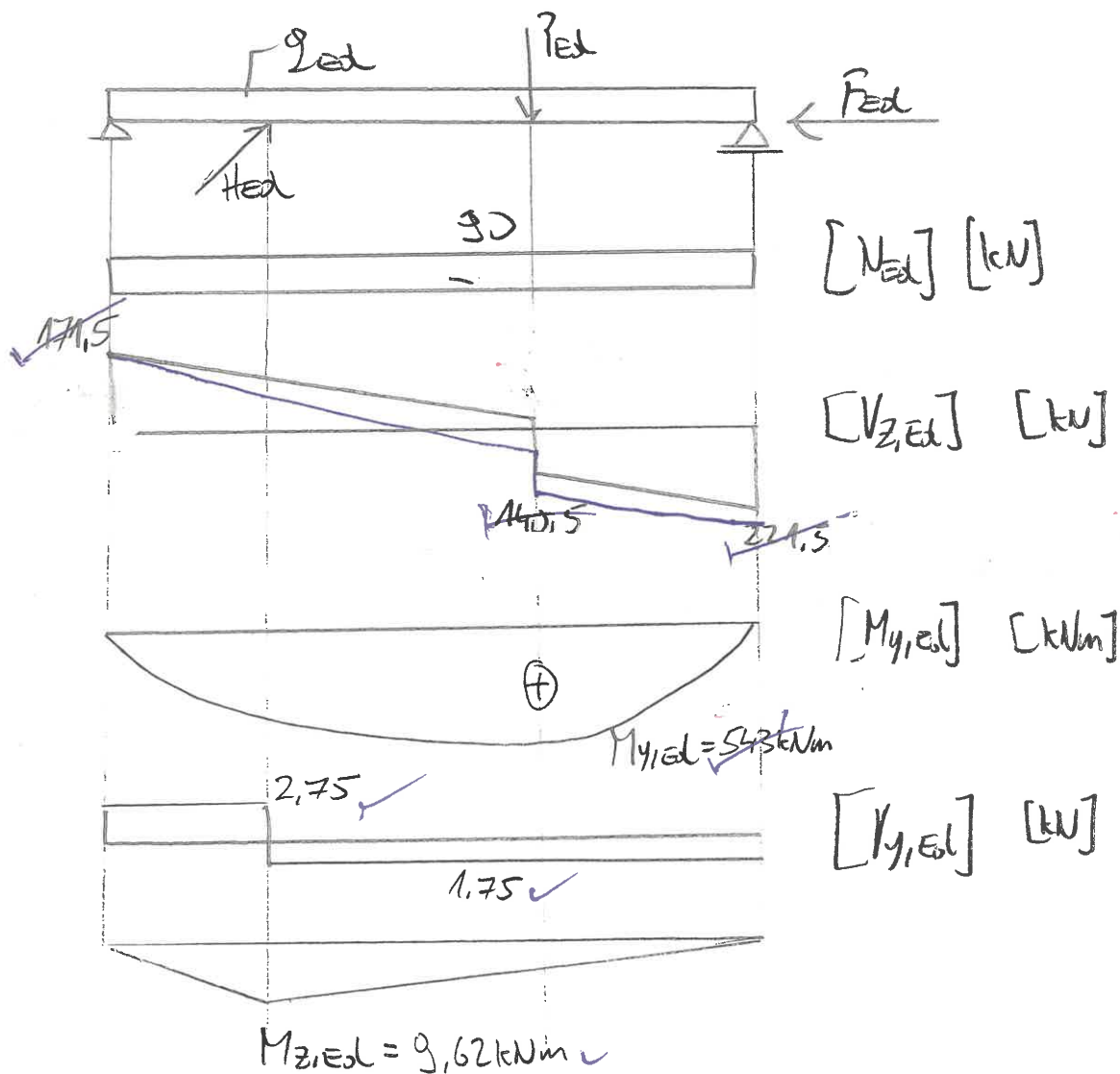
2 NALOBA

$$q_{ed} = 1,35 \cdot 20 = 27 \text{ kN/m}$$

$$H_{ed} = 1,5 \cdot 0,6 \cdot 5 = 4,5 \text{ kN}$$

$$P_{ed} = 1,5 \cdot 100 = 150 \text{ kN}$$

$$F_{ed} = 1,5 \cdot 0,6 \cdot 100 = 90 \text{ kN}$$



o KLASIFIKACIJA PREREZA: HEA 500 ; S 355

STOJINA

$$\alpha = \frac{80}{2 \cdot 1,2 \cdot 35,5} = 1,05$$

$$\alpha = \frac{1}{39} \left(\frac{39}{2} + 1,05 \right) = 0,53$$

$$\frac{39,0}{1,2} \leq \frac{396 \cdot 0,81}{13 \cdot 0,53 - 1}$$

$$32,5 \leq 54,45 \checkmark \quad \text{1. R. P.}$$

o PASMICA:

$$\frac{\Sigma}{L} \leq 3 \cdot \varepsilon$$

$$\frac{11,7}{2,3} = 5,08 \leq 7,29 \quad \text{A. R. ?}$$

PREREZ SPADA V A. R. ?

o ODBRUVIT PREREZA:

$$\frac{80}{198 \cdot \frac{35,5}{1,0}} + \frac{\cancel{545} \cdot 100}{3948 \cdot \frac{35,5}{1,0}} + \frac{3,62 \cdot 100}{1058 \cdot \frac{35,5}{1,0}} \leq 1,0$$

$$\frac{\cancel{0,425}}{1,0} \leq 1,0 \quad \checkmark$$

o STRIUNA ODBRUVIT PREREZA:

N y-y SMERI

$$2,75 \text{ kN} \leq \frac{144,72 \cdot 35,5}{\sqrt{3} \cdot 1,0} = 2966,57 \text{ kN} \quad \checkmark$$

$$V_{y,ed} \leq 50\% V_{y,red} \quad \checkmark$$

N z-z SMERI.

$$\cancel{221,5} \text{ kN} \leq \frac{74,90 \cdot 35,5}{\sqrt{3} \cdot 1,0} = 1535,23 \text{ kN} \quad \checkmark$$

$$V_{z,ed} \leq 50\% V_{z,red}$$

o izračun α_y :

$$L_y = 900 \text{ cm}$$

$$i_y = 21 \text{ cm}$$

$$\varepsilon = 0,21$$

$$\bar{\alpha}_y = 0,56 - \text{U.K. } \alpha) \rightarrow \underline{\alpha_y = 0,911}$$

o izračun χ_z :

$$P_z = 900 \text{ cm}$$

$$i_z = 7,24 \text{ cm}$$

$$\Sigma = 0,81$$

$$\bar{\lambda}_z = 1,63 - \text{U.K. b)} \rightarrow \underline{\chi_z = 0,239}$$

o izračun χ_{LT} :

$$C_1 = 1,13$$

$$z_g = 24,5 \text{ cm}$$

$$C_2 = 0,46$$

$$I_t = 308 \text{ cm}^4$$

$$L = 900 \text{ cm}$$

$$I_w = 5643000 \text{ cm}^6$$

$$I_z = 10370 \text{ cm}^4$$

$$G = 8077 \text{ kN/cm}^2$$

$$E = 21000 \text{ kN/cm}^2$$

$$M_{CR} = 86532,1 \text{ kNm}$$

$$\bar{\lambda}_{LT} = \sqrt{\frac{3843 \cdot 35,5^4}{86532,1}} = 1,27$$

$$\frac{h}{b} \leq 2 \quad \text{U.K. b)}$$

$$\phi_{LT} = 1,25$$

$$\chi_{LT} = \frac{1}{1,25 + \sqrt{1,25^2 - 0,75 \cdot 1,27^2}} = \underline{0,54}$$

faktorji C_{my} ; C_{mz} ; C_{mLT}

$$C_{my} = 0,95$$

$$C_{mz} = 0,8$$

$$C_{mLT} = 0,95$$

o faktorji k_{yy} ; k_{yz} ; k_{zy} ; k_{zz}

$$\underline{k_{yy} = 0,955}$$

$$0,95 \left(1 + (0,56 - 0,2) \cdot \frac{90}{0,911 \cdot \frac{198 \cdot 35,5}{1,0}} \right)$$

$$\leq 0,95 \left(1 + 0,8 \cdot \frac{90}{0,911 \cdot \frac{198 \cdot 35,5}{1,0}} \right)$$

$$0,955 \leq 0,96$$

$$\underline{k_{yz} = 0,6 \cdot k_{zz} = 0,572}$$

$$\underline{k_{zz} = 0,954}$$

$$0,9 \cdot \left(1 + (2 \cdot 1,63 - 0,6) \cdot \frac{90}{0,299 \cdot \frac{198 \cdot 35,5}{1,0}} \right)$$

$$\leq 0,9 \left(1 + 1,4 \cdot \frac{90}{0,299 \cdot \frac{198 \cdot 35,5}{1,0}} \right)$$

$$1,002 \leq 0,954$$

$$\underline{k_{zy} = 0,994}$$

$$\left[1 - \frac{0,1 \cdot 1,63}{(0,95 - 0,25)} \cdot \frac{90}{0,299 \cdot \frac{198 \cdot 35,5}{1,0}} \right]$$

$$\geq \left[1 - \frac{0,1}{(0,95 - 0,25)} \cdot \frac{90}{0,299 \cdot \frac{198 \cdot 35,5}{1,0}} \right]$$

$$0,99 \geq 0,994$$

0 KONTROLA NOSILCA : UKLON + UPLOMB (ZURITEV)

$$\frac{30}{2,811 \cdot \frac{198 \cdot 35,5}{1,0}} + 0,955 \cdot \frac{54300 \checkmark}{0,54 \cdot 3949 \cdot 35,5} + 0,572 \cdot \frac{962}{1059 \cdot 35,5} \leq 1,0$$

$$\underline{0,743 \leq 1,0 \checkmark}$$

$$\frac{30}{0,289 \cdot \frac{198 \cdot 35,5}{1,0}} + 0,994 \cdot \frac{54300 \checkmark}{0,54 \cdot 3949 \cdot 35,5} + 0,954 \cdot \frac{962}{1059 \cdot 35,5} \leq 1,0$$

$$\underline{0,778 \leq 1,0 \checkmark}$$

NOSILEC PO MSN USPREZA !

DEFORMACIJA NOSILCA :

$$P_{ed} = 100 \text{ kN}$$

$$I_y = 86570 \text{ cm}^4$$

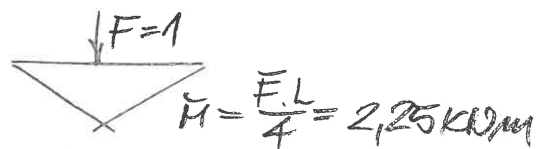
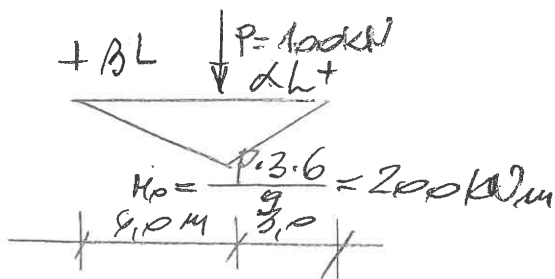
$$E = 21000 \text{ kN/cm}^2$$

$$L = 900 \text{ cm}$$

$$v(x) = \int \frac{M \cdot \bar{m}}{EI} \cdot dx$$

$$v\left(\frac{L}{2}\right) = 0,708 \text{ cm} \leq \frac{L}{300} = 3 \text{ cm} \checkmark$$

NOSILEC PO MSU USPREZA !



$$\delta = \frac{H_p \cdot \bar{m}}{12(6/9)} \left(3 - 4 \left(\frac{3}{9} \right)^2 \right) \frac{L}{EI} = \frac{20000 \cdot 225}{12(6/9)} \left(3 - 4 \left(\frac{3}{9} \right)^2 \right) \frac{900}{21000 \cdot 86570} \quad 6$$

$$\underline{\delta = 0,7083 \text{ cm} < L/300 = 3,00 \text{ cm}}$$

