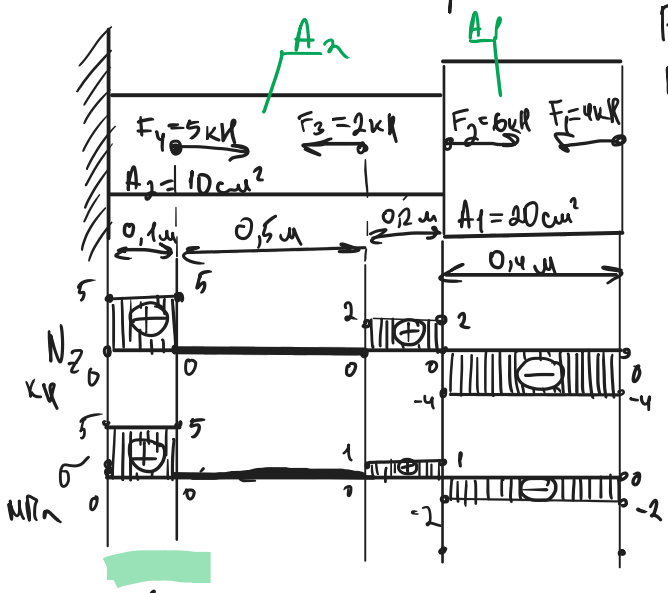
10 Вариант



$F_1 = 4\,кН$ $a_1 = 0{,}4\,м$

$F_2 = 6\,кН$ $a_2 = 0{,}2\,м$

$F_3 = 2\,кН$ $a_3 = 0{,}5\,м$

$F_4 = 5\,кН$ $a_4 = 0{,}1\,м$

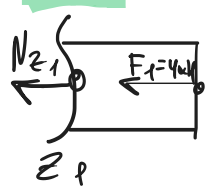
$A_1 = 20\,см^2$

$A_2 = 10\,см^2$

$N_z - ?$

$\Delta l_\Sigma - ?$ $\sigma - ?$ $\Delta l - ?$

$E = 2 \cdot 10^5$



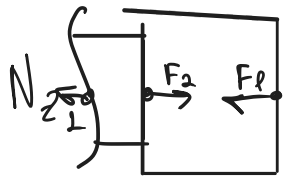
$N_{z_1} + F_1 = 0$

$N_{z_1} = -F_1 = -4\,кН$

$z_1 (0; 0{,}4)\,м$

$\sigma_I = \frac{N_{z1}}{A1} = \frac{-4000\,Н}{20 \cdot 10^{-4}\,м} = -2 \cdot 10^6\,Па = -2\,МПа$

$\Delta l_I = \frac{\sigma_1 \cdot a_1}{E} = \frac{-2 \cdot 0{,}4}{2 \cdot 10^5} = -4 \cdot 10^{-3}\,мм$

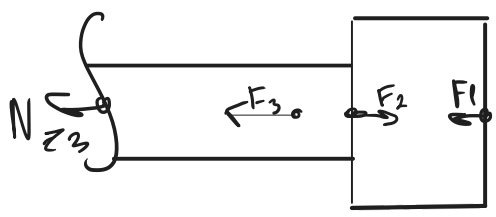


$N_{z_2} - F_2 + F_1$

$N_{z_2} = F_2 - F_1 = 6 - 4 = 2\,кН$

$\sigma_{II} = \frac{N_{z2}}{A1} = \frac{2000}{20 \cdot 10^{-4}} = 1 \cdot 10^6\,Па = 1\,МПа$

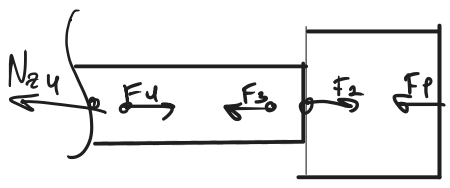
$\Delta l_2 = \frac{\sigma_2 a_2}{E} = \frac{1 \cdot 0{,}2}{2 \cdot 10^5} = 1 \cdot 10^{-3}\,мм$



$N_{z_3} + F_3 - F_2 + F_1$

$N_{z_3} = F_2 - F_3 - F_1 = 0$

$\sigma_{II} = 0$ $\Delta l_3 = 0$



$N_{z_4} - F_4 + F_3 - F_2 + F_1$

$N_{z_4} = F_4 - F_3 + F_2 - F_1 = 5\,кН$

$\sigma_{II} = \frac{N_{z4}}{A_2} = \frac{5000\,Н}{10 \cdot 10^{-4}\,м} = 5 \cdot 10^6\,Па = 5\,МПа$

$\Delta l_{II} = \frac{\sigma_4 \cdot a_4}{E} = \frac{5 \cdot 0{,}1}{2 \cdot 10^5} = 2{,}5 \cdot 10^{-3}\,мм$

$\Delta l_\Sigma = \Delta l_1 + \Delta l_2 + \Delta l_3 + \Delta l_4 =$

$= -0{,}5 \cdot 10^{-3}$