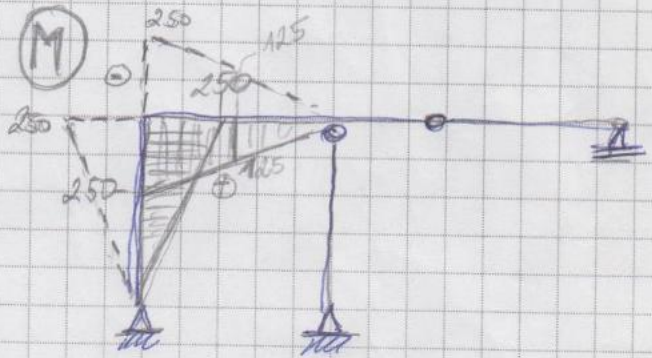
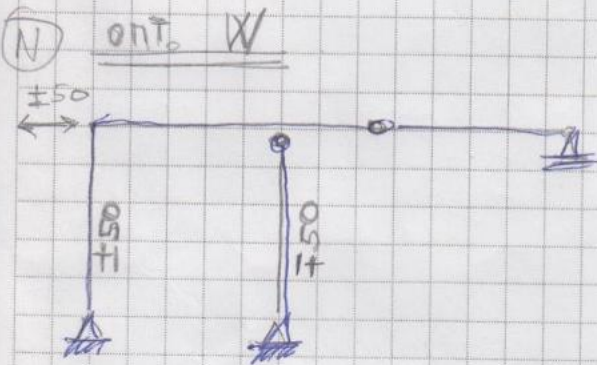
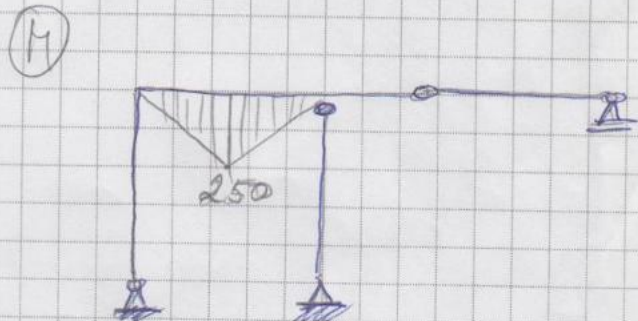
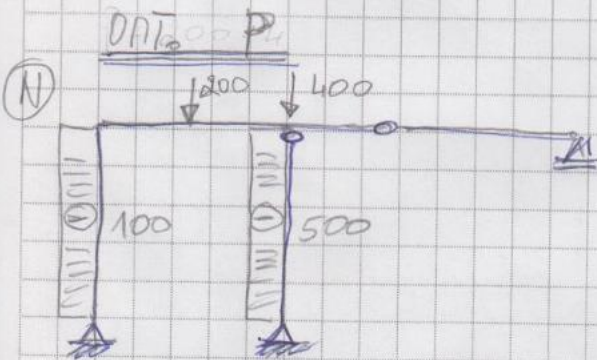
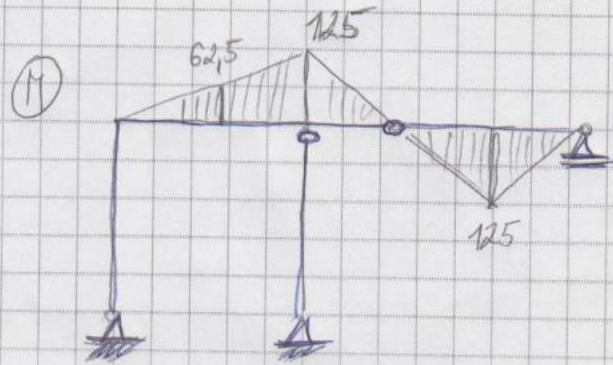
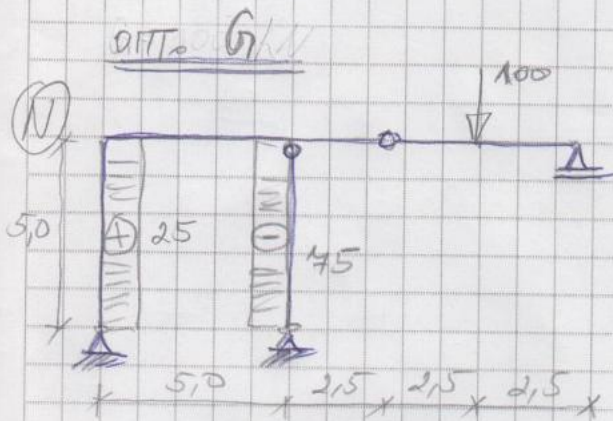


ЗАДАТАК 1.1

СТР 1.



POS 1

$$M_u = 1,6 \cdot 125 \text{ KNm} = 200 \text{ KNm}$$

ИФЕТН. $a_1 = 50 \text{ cm} \Rightarrow h = 50 - 5 = 45 \text{ cm}$ $b/d/l_0 = 30/50/45 \text{ cm}$

$M \leq 30 \Rightarrow f_b = 2,05 \text{ KN/cm}^2$ $B 500 \Rightarrow G_v = 50 \text{ KN/cm}^2$

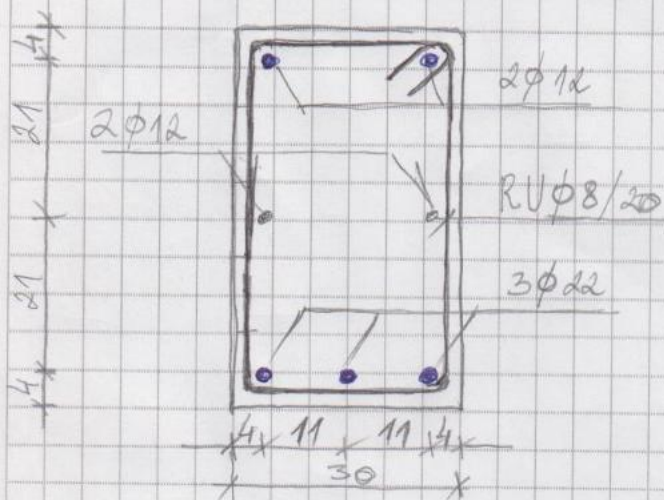
$$k = \frac{45}{\sqrt{\frac{200 \cdot 10^2}{30 \cdot 2,05}}} = 2,495 \Rightarrow \epsilon_a / \epsilon_b = 10 / 2,945 \%$$

$$\mu = 14,491 \%$$

$$A_a = 14,491 \cdot \frac{30 \cdot 45}{100} \cdot \frac{2,05}{50} = 9,85 \text{ cm}^2$$

УСВ. $3 \phi 22 (11,4 \text{ cm}^2)$

POS 1



POS 2

a) ИЗНАД СЛУБА S1 1)

$$M_u = \pm 1,8 \cdot 250 = \pm 450 \text{ KNm}$$

ГОРНА ЗОНА:

$$M_B 30 \Rightarrow f_B = 2,05 \text{ KN/cm}^2$$

$$B 500 \Rightarrow \sigma_v = 50 \text{ KN/cm}^2$$

$$\text{ПРЕТНО, } a_1 = 7 \text{ cm} \Rightarrow h = 60 - 7 = 53 \text{ cm} \quad b/d/h = 30/60/53 \text{ cm}$$

$$k = \frac{53}{\sqrt{\frac{450 \cdot 10^2}{30 \cdot 2,05}}} = 1,959 \Rightarrow \epsilon_0/\epsilon_a = 3,5 / 5,65 \% \quad \bar{\mu} = 30,365 \%$$

$$A_a = 30,365 \cdot \frac{30 \cdot 53}{100} \cdot \frac{2,05}{50} = 20,19 \text{ cm}^2 \quad \underline{\text{УСВ. } 5\phi 25 (24,55 \text{ cm}^2)}$$

ДОННА ЗОНА:

ПРЕТНО \rightarrow НЕУТРАЛНА ЛИНИЈА ЈЕ У ПРОУЧИ

$$a_1 = 7 \text{ cm} \Rightarrow h = 60 - 7 = 53 \text{ cm} \quad b/d/h = 80/60/53 \text{ cm}$$

$$k = \frac{53}{\sqrt{\frac{450 \cdot 10^2}{80 \cdot 2,05}}} = 3,2 \Rightarrow \epsilon_0/\epsilon_a = 10 / 1,9 \% \quad \bar{\mu} = 10,365 \quad s = 0,16$$

$$x = s \cdot h = 0,16 \cdot 53 = 8,48 \text{ cm} < d_p = 15 \text{ cm}$$

$$A_a = 10,365 \cdot \frac{80 \cdot 53}{100} \cdot \frac{2,05}{50} = 18,02 \text{ cm}^2 \quad \underline{\text{УСВ. } 3\phi 25 + 2\phi 16 (18,75 \text{ cm}^2)}$$

1) МОЖЕ И ПРИМЕНОМ ДИЈАГРАМА ИНТЕРАКЦИЈЕ ($\pm M_u$, ЗАНЕМАРИВ ЕФЕКТ ШИРИНЕ ПРЕСЕКА)

а) ПРЕСЕК ИЗНАД СТУПА S2

$$M_u = 1,6 \cdot 125 = 200 \text{ KNm}$$

ПРЕТП. $a_1 = 5 \text{ cm} \Rightarrow h = 60 - 5 = 55 \text{ cm}$ $b/d/h = 30/60/55 \text{ cm}$

$$k = \frac{55}{\sqrt{\frac{200 \cdot 10^2}{30 \cdot 2,05}}} = 3,05 \Rightarrow \epsilon_a/\epsilon_b = 10/2,05 \% \quad \bar{\mu} = 11,48\%$$

$$A_a = 11,48 \cdot \frac{30 \cdot 55}{100} \cdot \frac{2,05}{50} = 7,77 \text{ cm}^2 \quad \text{УСБ } 2 \phi 25 (9,82 \text{ cm}^2)$$

б) ПРЕСЕК У ПОЛУ

61X

ГОРЊА ЗОНА 2) НИЈЕ НЕОПХОДНО

ПРЕТП. $a_1 = 5 \text{ cm} \Rightarrow h = 60 - 5 = 55 \text{ cm}$ $b/d/h = 30/60/55 \text{ cm}$

$$M_u = 1,6 \cdot 62,5 + 1,8 \cdot 125 = 325 \text{ KNm}$$

$$k = \frac{55}{\sqrt{\frac{325 \cdot 10^2}{30 \cdot 2,05}}} = 2,393 \Rightarrow \epsilon_a/\epsilon_b = 10/3,25 \% \quad \bar{\mu} = 19,49\%$$

$$A_a = 19,49 \cdot \frac{30 \cdot 55}{100} \cdot \frac{2,05}{50} = 13,19 \text{ cm}^2 \quad \text{УСБ } 3 \phi 25 (14,73 \text{ cm}^2)$$

ДОНЈА ЗОНА 3

$$M_u = 1,0 \cdot (-62,5) + 1,8 \cdot (250 + 125) = 612,5 \text{ KNm}$$

ПРЕТП. НЕУТРАДНА ЛИНИЈА ЈЕ У ПОЛУ

$a_1 = 7 \text{ cm} \Rightarrow h = 60 - 7 = 53 \text{ cm}$ $b/d/h = 80/60/53$

$$k = \frac{53}{\sqrt{\frac{612,5 \cdot 10^2}{80 \cdot 2,05}}} = 2,742 \Rightarrow \epsilon_a/\epsilon_b = 10/2,745 \% \quad \bar{\mu} = 14,49\% \quad s = 0,198$$

$$x = s \cdot h = 0,198 \cdot 53 = 10,5 \text{ cm} < d_p = 15 \text{ cm}$$

$$A_a = 14,49 \cdot \frac{80 \cdot 53}{100} \cdot \frac{2,05}{50} = 25,2 \text{ cm}^2 \quad \text{УСБ } 6 \phi 25 (29,46 \text{ cm}^2)$$

2) НИЈЕ НЕОПХОДНО - ЛИНЕАРНА ПРОМЕНА ОД 450 KNm (ИЗНАД S1) ДО 200 KNm (ИЗНАД S2) ОМОГУЋАВА "ВОЂЕЊЕ АРМАТУРЕ"

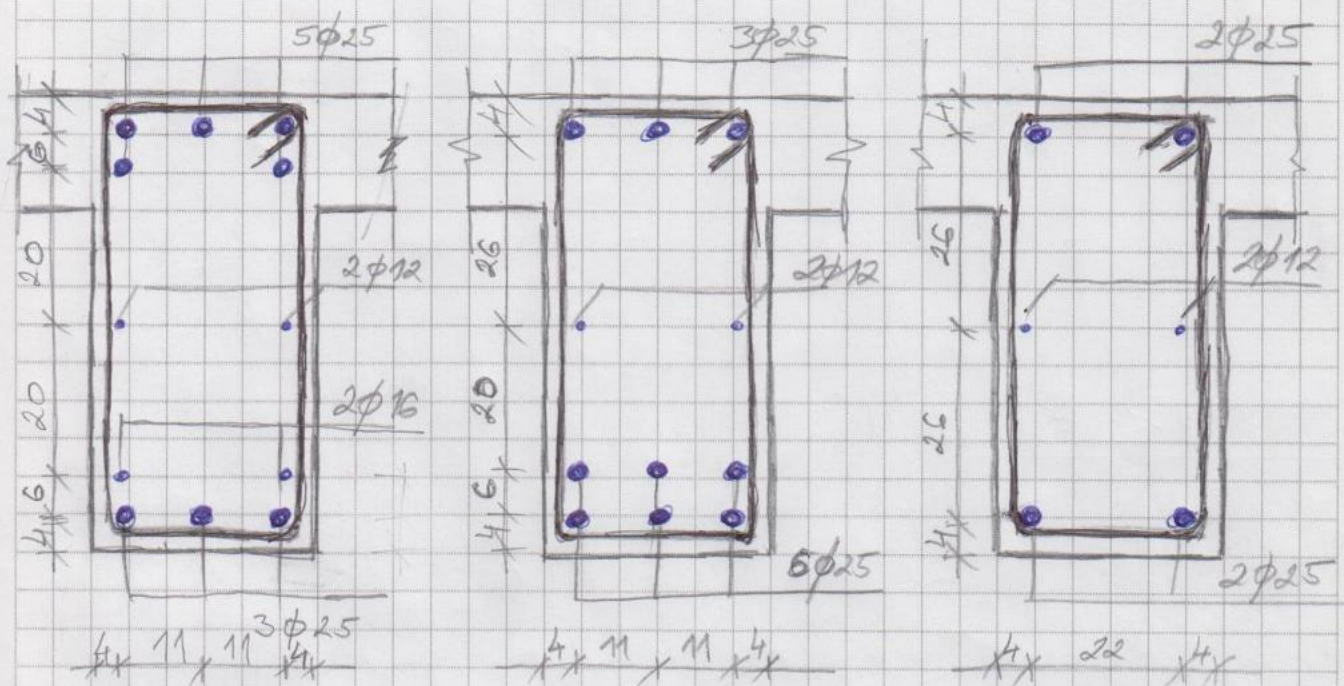
POS 2

СТР. 4

УЗНАД S1

У ПОСР

УЗНАД S2



POS S1

a) $F_u = 1,6 \cdot 25 = 40 \text{ kN}$

б) $N_u = 1,2 \cdot (-25) + 2,1 \cdot 100 = 180 \text{ kN}$

в) $F_u = 1,6 \cdot 25 + 1,8 \cdot 50 = 130 \text{ kN}$
 $M_u = 1,8 \cdot 250 = 450 \text{ kNm}$ } MIN N CИЛА

г) $N_u = 1,0 \cdot (-25) + 1,8 \cdot (100 + 50) = 245 \text{ kN}$
 $M_u = 1,8 \cdot 250 = 450 \text{ kNm}$ } MAX N CИЛА

MIN N

$F_u = 130 \text{ kN}$ 3)

$M_u = 450 \text{ kNm}$

претп. $a/d = 0,15 \Rightarrow$ ПБАБ-2 АЦАГРАМ 2.4012 (СТР. 137)

$\mu_u = \frac{450 \cdot 100}{30 \cdot 50 \cdot 2,05} = 0,293$
 $\mu_u = -\frac{130}{30 \cdot 50 \cdot 2,05} = -0,042$ } $\bar{\mu} = 0,425 \quad \epsilon_{a1} = 10\%$

3) МОЖЕ СЕ РЕШИТИ И БЕЗ ДИЈАГРАМА ИНТЕРАКЦИЈЕ

$$A_{a1} = A_{a2} = 0,425 \cdot 30 \cdot 50 \cdot \frac{2,05}{50} = \underline{26,14 \text{ cm}^2}$$

MAX N

$$N_u = 245 \text{ kN}$$

$$M_u = 450 \text{ kNm}$$

ПРЕП. $a/d = 0,15 \Rightarrow$ ПБАБ-2 АУДАГРАМ $2 \times \phi_{12}$ (СТР. 137)

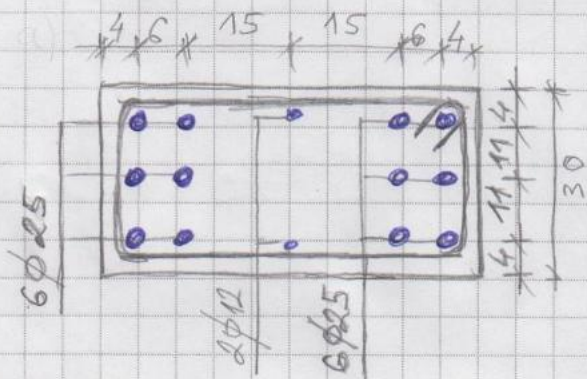
$$\mu_u = \frac{450 \cdot 10^2}{30 \cdot 50^2 \cdot 2,05} = 0,233$$

$$\mu_n = \frac{245}{30 \cdot 50 \cdot 2,05} = 0,080 \quad \left. \vphantom{\mu_u} \right\} \bar{m} = 0,365\% \quad \epsilon_{a1} = 10\%$$

$$A_{a1} = A_{a2} = 0,365 \cdot 30 \cdot 50 \cdot \frac{2,05}{50} = \underline{22,45 \text{ cm}^2}$$

УСВ. $\pm 6 \phi 25$ ($\pm 29,46 \text{ cm}^2 = 58,92 \text{ cm}^2$)

$$a_1 = \frac{3 \cdot 4 + 3 \cdot 10}{6} = 4 \text{ cm} \approx 0,15 \cdot 50 = 7,5 \text{ cm} = a_{\text{ПРЕП.}}$$

POS S2

$$N_g = 75 \text{ kN} \quad N_p = 500 \text{ kN} \quad N_w = \pm 50 \text{ kN}$$

1) ЭКЦЕНТРИЦИТЕТ ПО ТЕОРИЈУ I РЕДА $\lambda =$

$$e_i = \frac{\sum M}{\sum N} = 0 < 3,5$$

$$\lambda_R = \sqrt{\frac{30^2/12}{30^2}} = \frac{30}{\sqrt{12}} = 8,66 \text{ cm} \Rightarrow \lambda = \frac{500}{8,66} = 57,7 > 25$$

ИЗБУДЖАКЕ СЕ ПОРА УЗЕТУ \checkmark ОБЗАР ∇

2) ЕКСЦ. УСЛЕД ИМПЕРФЕКЦИЈА

$$e_0 = \frac{500}{300} = 1,66 \text{ cm} < 2 \text{ cm} = e_{0, \text{MIN}}$$

$$\text{УСВ. } e_0 = 2 \text{ cm}$$

3) ЕКСЦ. УСЛЕД ЕФЕКТА ТЕЧЕЊА

$$\text{а) } \frac{N_d}{N} = \frac{75}{625} = 0,12 < 0,2$$

$$\text{б) } \lambda = 57,7 > 50$$

ИСПУЊЕН ЈЕ УСЛОВ а) и ЕФЕКАТ ТЕЧЕЊА СЕ ЗАКЕМАРУЈЕ

$$e_y = 0$$

4) ДОПУНСКА ЕКСЦ.

$$\lambda = 57,7 < 75 \text{ (УМЕРЕНА БИТКОСТ)}$$

УПРОШЋЕН ПОДАТАК ТЕОРИЈЕ II РЕДА:

$$\frac{e_1}{d} = 0 \Rightarrow e_d = 30 \cdot \frac{57,7 - 25}{100} \sqrt{0,1} = 3,10 \text{ cm}$$

5) УКУПАН ЕКСЦ.

$$e_2 = 2 + 3,10 = 5,1 \text{ cm}$$

$$\text{ПРЕТП. } \varepsilon_{a1} < 0\%$$

$$N_u = 1,9 \cdot 75 + 2,1 \cdot (500 + 50) = 1297,5 \text{ kN}$$

$$M_u = 1297,5 \cdot 0,051 = 66,17 \text{ kNm}$$

$$\text{ПРЕТП. } \alpha/d = 0,15 \Rightarrow \text{ПБЛБ-2 ДИЗАЈН 2.4.12 (СТР 137)}$$

$$\eta_u = \frac{66,17 \cdot 10^2}{30^3 \cdot 2,05} = 0,120$$

$$\eta_u = \frac{1297,5}{30^2 \cdot 2,05} = 0,703$$

$$\bar{\mu} = 0,04 \quad 0\% < \varepsilon_{a1} < 0,5\% \\ \varepsilon_{a1} \approx 0,15\%$$

ВРШИ СЕ КОРЕКЦИЈА КОЕФ. СИГУРНОСТИ

$$\gamma_g = 1,9 - \frac{1,9 - 1,6}{3 - 0} \cdot 0,15 = 1,885$$

$$\gamma_p = 2,1 - \frac{2,1 - 1,8}{3 - 0} \cdot 0,15 = 2,085$$

$$N_u = 1,885 \cdot 75 + 2,085 \cdot (500 + 50) = 1288,13 \text{ kN}$$

$$M_u = 1288,13 \cdot 0,051 = 65,69 \text{ kNm}$$

$$\mu_u = \frac{65,69 \cdot 10^2}{30^3 \cdot 2,05} = 0,119$$

$$\nu_u = \frac{1288,13}{30^2 \cdot 2,05} = 0,698$$

$$\left. \begin{array}{l} \mu_u = 0,119 \\ \nu_u = 0,698 \end{array} \right\} \mu = 0,037\% \quad \epsilon_{a1} = 0,15\%$$

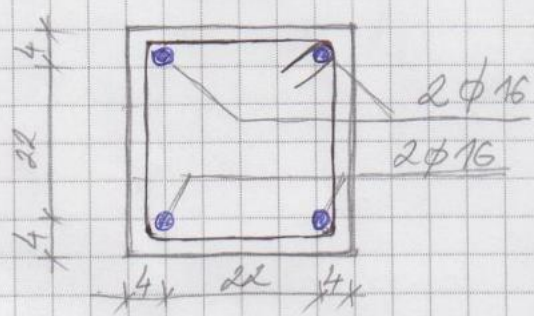
$$A_{a1} = A_{a2} = 0,034 \cdot \frac{2,05}{50} \cdot 30^2 = 1,37 \text{ cm}^2$$

ПРОВЕРА: $\mu = \frac{2 \cdot 1,37}{30^2} = 0,30\% < \mu_{\min} = \frac{57,4}{50} \cdot 0,4 = 0,4592\% (> 0,6\%)$

$$A_a = 0,754 \cdot \frac{30^2}{100} = 6,8 \text{ cm}^2$$

ПОСЛ

УСВ. 4φ16 (8,04 cm²)



ЗАДАЧА 102

$$A_b = 30 \cdot 50 = 1500 \text{ cm}^2$$

$$A_{a1} = 11,4 \text{ cm}^2 (3\phi 22)$$

$$J_b = \frac{30 \cdot 50^3}{12} = 312500 \text{ cm}^4$$

$$A_{a2} = 0 \text{ (РАЧУНСКИ)}$$

ЕЛАСТИЧНИ УГИБ

$$\nu_b = \frac{1}{48} \cdot \frac{100 \cdot 5^3}{31,5 \cdot 10^6 \cdot 312500 \cdot 10^{-8}} \cdot 10^3 = 2,65 \text{ mm}$$

СТАЊЕ I (БЕЗ ПРЕЛИНА) t=0

$$A_i^I = 1500 + \frac{210}{31,5} \cdot 11,4 = 1576 \text{ cm}^2$$

$$y_{i2}^I = 25 + \frac{(46 - 25) \cdot 66 \cdot 11,4}{1576} = 26,01 \text{ cm}$$

$$J_i^I = 312500 + 1500 (46 - 25) \cdot (26,01 - 25) = 344315 \text{ cm}^4$$

$$\rho_{k0}^I = \frac{312500}{344315} = 0,908$$

ПРОВЕРА: $\rho_k^I = 0,91 \approx 0,908$ } ПЕАБ-2 3.4.2. (СТР. 315) $A_{a2}/A_{a1} = 0$
 $\frac{\rho}{\alpha} = 0,08 \approx 0,1 \quad \alpha_2 = 0,084 < 0,1 \quad \frac{nA_{a1}}{b \cdot h} = 0,055$

$$V_{II}^I(t_0) = 0,908 \cdot 2,65 = \underline{2,41 \text{ мкм}}$$

СТАЖЕ II (СА ПРЕЛУНАМА) $t=0$

$$\mu_1 = \frac{11,4}{30 \cdot 46} = 0,82\% \quad \mu_2 = 0$$

$$s^2 + 2 \cdot 6,6 \cdot 0,82 \cdot 10^{-2} \cdot s - 2 \cdot 6,6 \cdot 0,82 \cdot 10^{-2} = 0$$

$$s^2 + 0,1093s - 0,1093 = 0 \Rightarrow \underline{s = 0,280}$$

$$x'' = 0,28 \cdot 46 = 12,88 \text{ см}$$

$$A_B'' = 30 \cdot 12,88 = 386,4 \text{ см}^2$$

$$y_B'' = \frac{12,88}{2} = 6,44 \text{ см}$$

$$J_B'' = \frac{30 \cdot 12,88^3}{12} = 5342 \text{ см}^4$$

$$J_i'' = 5342 + 386,4 \cdot (46 - 6,44) (12,88 - 6,44) = 103784 \text{ см}^4$$

$$k_a'' = \frac{312500}{103784} = 3,01$$

ПРОВЕРА: $k_a'' = 3,04 \approx 3,01$ } ПБАБ-2 3.4.6. (СТР. 317)

$$\frac{a}{d} = 0,08 \approx 0,1 \quad d_2 = 90870,2 \quad \frac{\eta A_{c1}}{E a} = 0,055$$

$$V_{II}''(t_0) = 3,01 \cdot 2,65 = \underline{7,98 \text{ мкм}}$$

$$f_{\text{гзс}} = 2,4 \cdot \left(0,6 + \frac{94}{4 \sqrt{0,5}}\right) = 2,58 \text{ МПа}; \quad W_{i1}'' = \frac{344315}{50 + 26,01} = 14352 \text{ см}^3$$

$$M_r = 0,258 \cdot 14352 \cdot 10^{-2} = 37,03 \text{ кНм} < M_g = 125 \text{ кНм}$$

$$\beta_1 = 1,0 \text{ (ЗЕТО ЗА РА)}$$

$$\beta_2 = 1,0 \text{ (} t=0 \text{)}$$

$$\Rightarrow \xi = 1 - 1,0 \cdot 1,0 \cdot \frac{37,03}{125} = 0,704 > 0,4$$

$$v_{II}(t_0) = (1 - 0,704) \cdot 2,41 + 0,704 \cdot 7,98 = \underline{6,33 \text{ мкм}}$$

СТАЖЕ I (БЕЗ ПРЕЛУНА) ($t \rightarrow \infty$)

$$p_{\infty} = 2,5$$

$$k_{\text{оп}} = 0,8$$

$$0,8 \cdot 2,5 = 2,0 \Rightarrow E_B^* = \frac{31,5}{1 + 2,0} = 10,5 \text{ ГПа}$$

$$n^* = \frac{210}{10,5} = 20$$

$$A_i^* = 1500 + 20 \cdot 11,4 = 1728 \text{ см}^2$$

$$y_{i2}^{*I} = 25 + \frac{(46-25) \cdot 20 \cdot 11,4}{1728} = 27,77 \text{ см}$$

$$y_{i1}^{*I} = 312500 + 1500 \cdot (46-25) \cdot (27,77-25) = 399755 \text{ см}^4$$

$$k_p^I = 1 - \frac{20}{399755} \cdot [11,4 (46-26,01)(46-27,77)] = 0,992$$

ПРОВЕРКА: $k_p = 0,79 \times 0,992$ } ПБАБ-2 3.4.14. (СТР. 321) $\frac{A_{a1}}{A_{a2}} = 0$
 $\frac{a}{d} = 0,08 \approx 0,1$ $\alpha_2 = 0,087 < 0,2$ $\frac{nA_{a1}}{bh} = 0,55$
 $\beta \cdot \rho = 2,0$

$$v_{II}^I(t_{\infty}) = (1 + 0,992 \cdot 2,5) \cdot 2,41 = \underline{7,18 \text{ мм}}$$

СТАДИЯ II (СА ПРОСЛИХАНА) $t \rightarrow \infty$

$$A_i^{*II} = 386,4 + 20 \cdot 11,4 = 614,4 \text{ см}^2$$

$$y_{i2}^{*II} = 6,44 + \frac{(46-6,44) \cdot 20 \cdot 11,4}{614,4} = 21,12 \text{ см}$$

$$y_{i1}^{*II} = 5342 + 386,4 \cdot (46-6,44) \cdot (21,12-6,44) = 229740 \text{ см}^4$$

$$k_p^{*II} = 1 - \frac{20}{229740} [11,4 (46-12,88)(46-21,12)] = 0,182$$

ПРОВЕРКА: $k_p^{*II} = 0,185 \approx 0,182$ } ПБАБ-2 3.4.26 (СТР. 327) $\beta \cdot \rho = 2,0$; $A_{a2}/A_{a1} = 0$
 $\frac{a}{d} = 0,08 \approx 0,1$ $\alpha_2 = 0,087 < 0,2$ $\frac{nA_{a1}}{bh} = 0,055$

$$v_{II}^{*II}(t_{\infty}) = (1 + 0,182 \cdot 2,5) \cdot 7,98 = \underline{11,61 \text{ мм}}$$

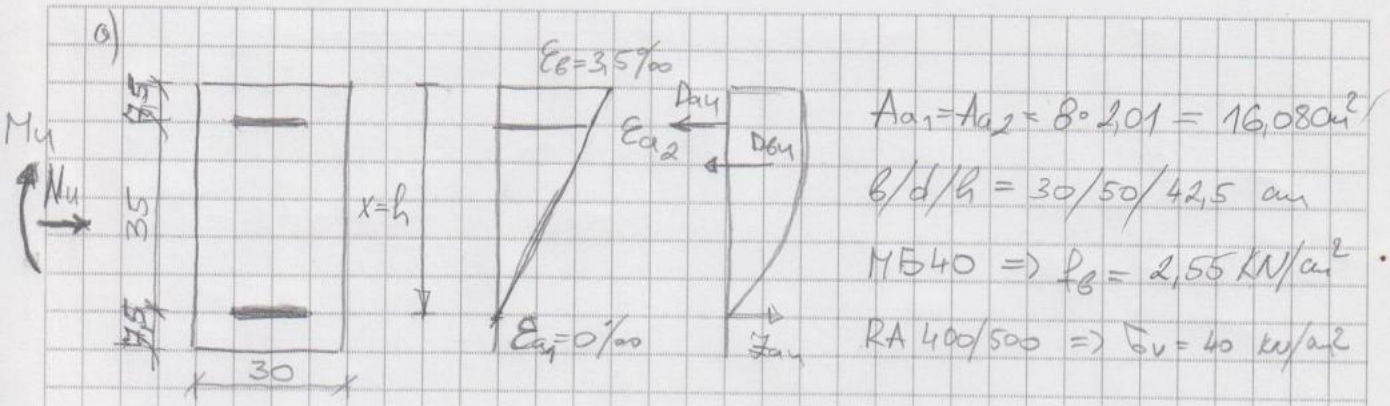
ТРАЖНИ УГЛУБ

$$\left. \begin{array}{l} \beta_1 = 1,0 \text{ (УЗЕТО ЗАРА)} \\ \beta_2 = 0,5 \text{ (} t \rightarrow \infty \text{)} \end{array} \right\} \gamma^{t \rightarrow \infty} = 1 - 1,0 \cdot 0,5 \cdot \frac{31,5}{125} = 0,874 > 0,4$$

$$v_{II}(t_{\infty}) = (1 - 0,874) \cdot 7,18 + 0,874 \cdot 11,61 = \underline{11,05 \text{ мм}}$$

ЗАДАЧА 2.

СТР. 10



$A_{s1} = A_{s2} = 8 \cdot 2,01 = 16,08 \text{ cm}^2$
 $b/d/h = 30/50/42,5 \text{ cm}$
 МБ40 $\Rightarrow f_b = 2,55 \text{ kN/cm}^2$
 RA 400/500 $\Rightarrow f_v = 40 \text{ kN/cm}^2$

$\sum F_{ax} = 0$

$D_{bu} = \alpha_b \cdot s \cdot b \cdot h \cdot f_b$

$\alpha_b = \frac{3E_b - 2}{3E_b}$, $E_b = 3,5\text{‰} \Rightarrow \alpha_b = \frac{3 \cdot 3,5 - 2}{3 \cdot 3,5} = 0,809$

$x = h \Rightarrow s = 1$; JEP JE $s = \frac{x}{h}$

$D_{bu} = 0,809 \cdot 1 \cdot 30 \cdot 42,5 \cdot 2,55 = \underline{2630,3 \text{ kN}}$

$\epsilon_{e2} = \frac{E_b \cdot (h - a_2)}{h} = \frac{3,5 \cdot (42,5 - 7,5)}{42,5} = 2,88\text{‰} > 2\text{‰}$ (ЗА RA 400)

$D_{au} = 40 \cdot 16,08 = \underline{643,2 \text{ kN}}$

$\sum N_u = 0 \Rightarrow D_{bu} + D_{au} - N_u = 0 \Rightarrow N_u = 2630,3 + 643,2$

$N_u = \underline{\underline{3273,5 \text{ kN}}}$

$\xi = \xi \cdot h$

$\epsilon_b = 3,5\text{‰} \Rightarrow \eta = \frac{3,5 \cdot (3 \cdot 3,5 - 4) + 2}{2 \cdot 3,5 \cdot (3 \cdot 3,5 - 2)} = 0,416$

$\xi = h \cdot (1 - \eta \cdot s) = 42,5 \cdot (1 - 0,416 \cdot 1) = 24,82 \text{ cm}$

$\sum M = 0 \Rightarrow D_{bu} \cdot \xi + D_{au} \cdot (h - a_2) - N_u \cdot \left(\frac{d}{2} - a\right) = 0$

$M_u = 2630,3 \cdot 24,82 + 643,2 \cdot (42,5 - 7,5) = 3273,5 \cdot (25 - 7,5)$

$M_u = 30510,05 \text{ kNm}$

$M_u = \underline{\underline{305,1 \text{ kNm}}}$

$$\delta) \quad \bar{m} = \frac{A_{ax}}{b \cdot d} \cdot \frac{E_v}{E_B} = \frac{16,08}{30 \cdot 50} \cdot \frac{40}{2,55} = 0,168$$

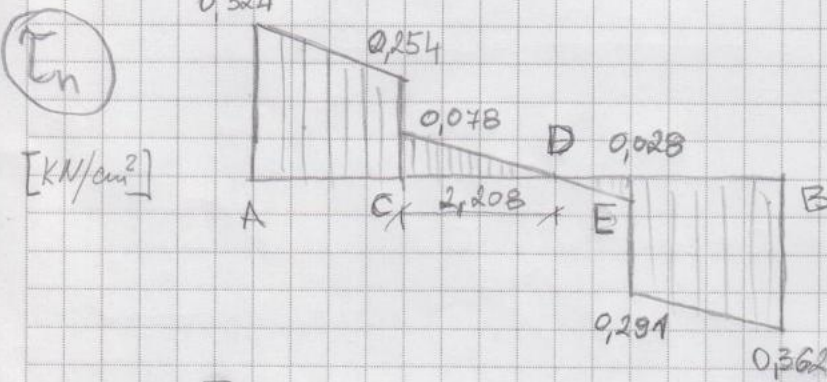
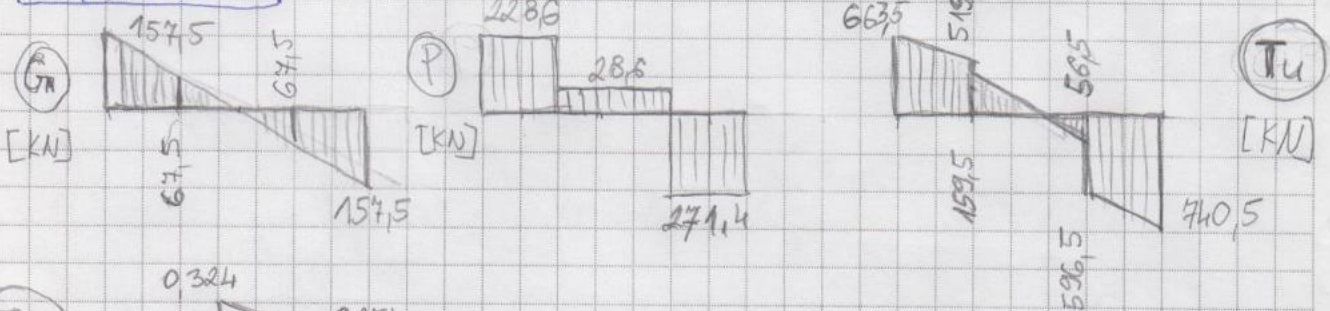
$$\frac{a}{d} = \frac{7,5}{50} = 0,15 \quad E_B/E_a = 3,5/0 \%$$

ПБАБ-2 АУДАГРАМ 204012 (СТР. 137)

$$N_u = 0,855 \Rightarrow N_u = 0,855 \cdot 30 \cdot 50 \cdot 2,55 = \underline{\underline{3270,4 \text{ KN}}}$$

$$M_u = 0,16 \Rightarrow M_u = 0,16 \cdot 30 \cdot 50^2 \cdot 2,55 = \underline{\underline{306,0 \text{ kNm}}}$$

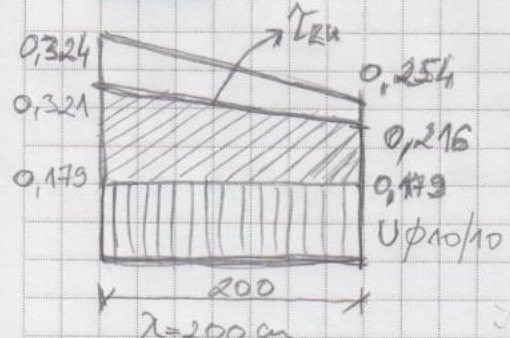
ЗАДАТАК 3



$M/30 \Rightarrow \tau_r = 0,11 \frac{\text{KN}}{\text{cm}^2}$
 $RA \ 400/500 \Rightarrow E_v = 40 \frac{\text{KN}}{\text{cm}^2}$
 $b/d/l = 35/75/65 \text{ cm}$
 $m = 2$
 $\phi 10 \Rightarrow a_u^{(a)} = 0,785 \text{ cm}^2$

$$\tau_u = \frac{T_u}{0,9 \cdot b \cdot h}$$

A-C



$$\tau_u = 0,324 \text{ kN/cm}^2 < 3\tau_r = 0,33 \text{ kN/cm}^2 \Rightarrow$$

$$\tau_{ru}^L = \frac{3}{2} (0,324 - 0,11) = 0,321 \text{ kN/cm}^2$$

$$\tau_{ru}^D = \frac{3}{2} (0,254 - 0,11) = 0,216 \text{ kN/cm}^2$$

$$e_u = \frac{2 \cdot 0,785}{35 \cdot 0,321} \cdot 40 = 5,59 \text{ cm } \underline{\underline{\text{JCB, U}\phi 10/10}}$$

$$\tau_{u, u} = \frac{2 \cdot 0,785}{35 \cdot 10} \cdot 40 = 0,179 \text{ kN/cm}^2$$

$$H_{vu, k} = \frac{200}{2} (0,321 - 0,179 + 0,216 - 0,179) \cdot 35 = 626,5 \text{ KN}$$

$$\alpha_R = 45^\circ \Rightarrow A_{ak} = \frac{626,5}{40 \cdot (0,707 + 0,707 \cdot 1)} = 11,08 \text{ cm}^2$$

УСВ. 3φ22 (11,4 cm²)

$$T_{bu} = \frac{1}{2} (3\tau_R - \tau_u) \cdot b \cdot z = \frac{1}{2} (0,11 \cdot 3 - 0,324) \cdot 35 \cdot 0,9 \cdot 65 = 6,14 \text{ KN}$$

$$T_{mu}^{RED} = 6,14 + 0,179 \cdot 35 \cdot 0,9 \cdot 65 = 372,64 \text{ KN}$$

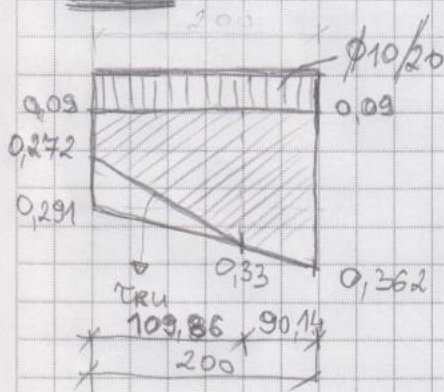
$$\Delta A = \frac{372,64}{2 \cdot 40} (1 - 0) = 4,66 \text{ cm}^2$$

УСВ. 2φ22 (7,60 cm²)

C-E

$$\tau_{cu}^{MAX} = 0,078 < \tau_R = 0,11 \text{ KN/cm}^2 \Rightarrow \text{НЕМА ОСИГУРАЊА } \nabla 4)$$

E-B



$$\tau_u^D = 0,362 > 3\tau_R \Rightarrow \tau_{cu}^D = \tau_u^D = 0,362 \text{ KN/cm}^2$$

$$\tau_u^L = 0,291 < 3\tau_R \Rightarrow \tau_{cu}^L = \frac{3}{2} (0,291 - 0,11) = 0,272 \text{ KN/cm}^2$$

НА ДУЖИЦИ ОСИГУРАЊА $\lambda = 200 \text{ cm}$
ПОТРЕБНО ЈЕ ОБЕЗБЕДИТИ MIN ВЕР. УЗЕТИЈЕ

$$e_u^{MAX} = \left\{ \begin{array}{l} 25 \text{ cm} \\ b=30 \text{ cm} \\ 65/2=32,5 \end{array} \right\} = 25 \text{ cm}$$

$$e_u = \frac{2 \cdot 0,785}{35 \cdot 0,2 \cdot 10^{-2}} = 22,4 \text{ cm}$$

$$\tau_{cu,u} = \frac{2 \cdot 0,785}{35 \cdot 20} \cdot 40 = 0,09 \text{ KN/cm}^2$$

УСВ. Uφ 10/20 cm

$$\lambda_1 = \frac{0,362 - 0,33}{0,362 - 0,291} \cdot 200 = 90,14 \text{ cm}$$

$$T_{vu,K} = \left[\frac{1}{2} (0,33 - 0,09 + 0,272 - 0,09) \cdot 109,86 + \frac{90,14}{2} (0,362 + 0,33 - 2 \cdot 0,09) \right] \cdot 35 = 1619,1 \text{ KN}$$

$$\alpha_K = 45^\circ \Rightarrow A_{ak} = \frac{1619,1}{40 \cdot (0,707 + 0,707 \cdot 1)} = 28,63 \text{ cm}^2$$

УСВ. 6φ25 (29,46 cm²)

$$T_{mu}^{RED} = 0,09 \cdot 35 \cdot 0,9 \cdot 65 = 184,28 \text{ KN}$$

$$\Delta A = \frac{184,28}{2 \cdot 40} (1 - 0) = 2,30 \text{ cm}^2$$

УСВ. 2φ22 (7,60 cm²)

4) УСВОЈЕНЕ КОНСТРУКТИВНЕ УЗЕТИЈЕ Uφ8/20