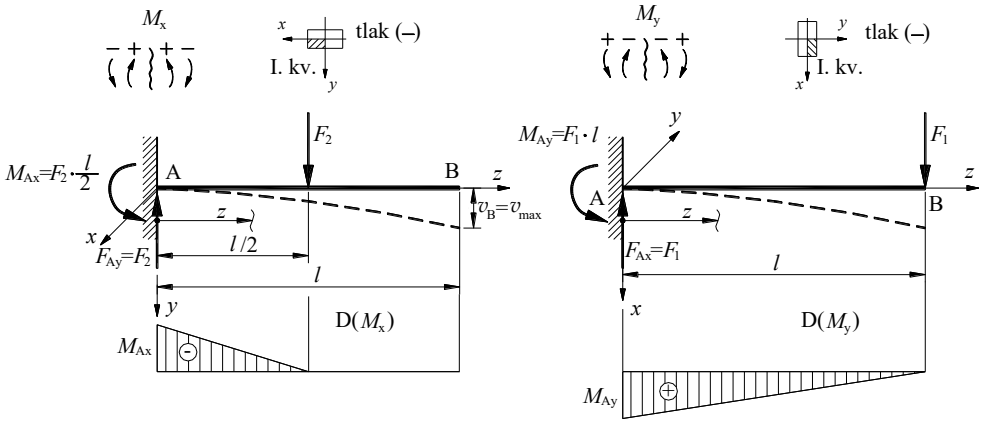
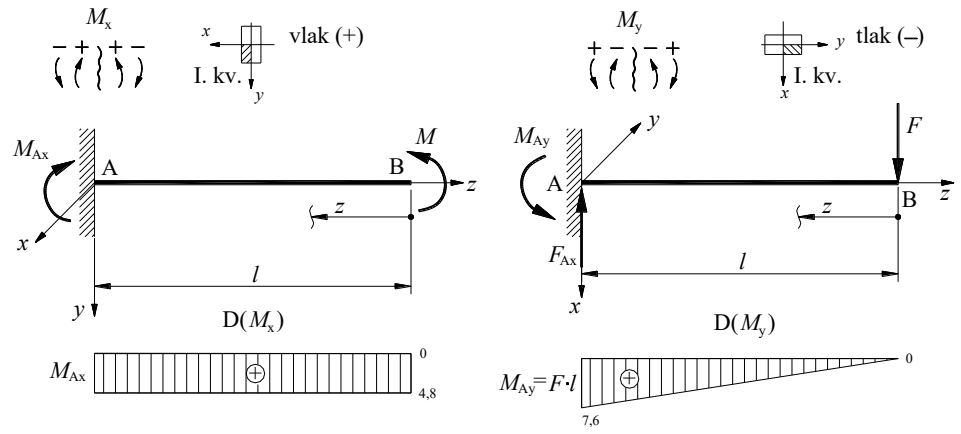
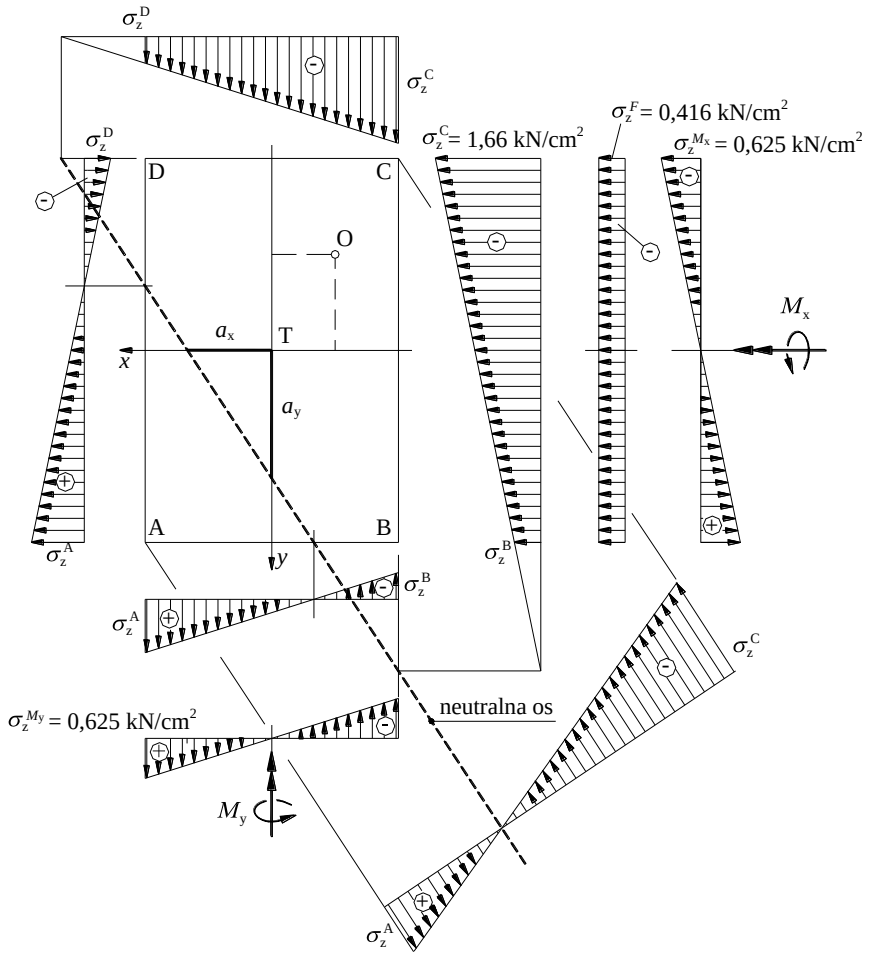
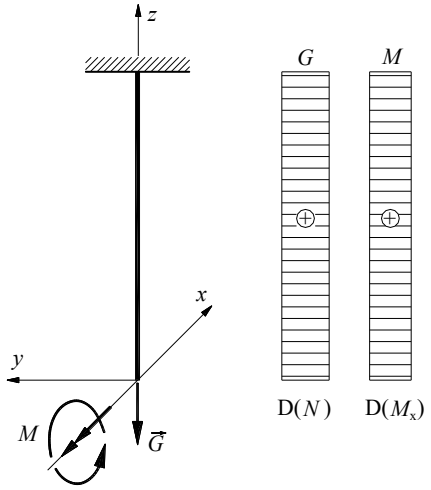
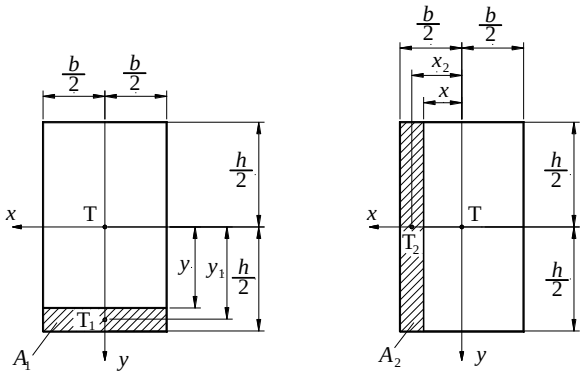
Ispravci u knjizi:

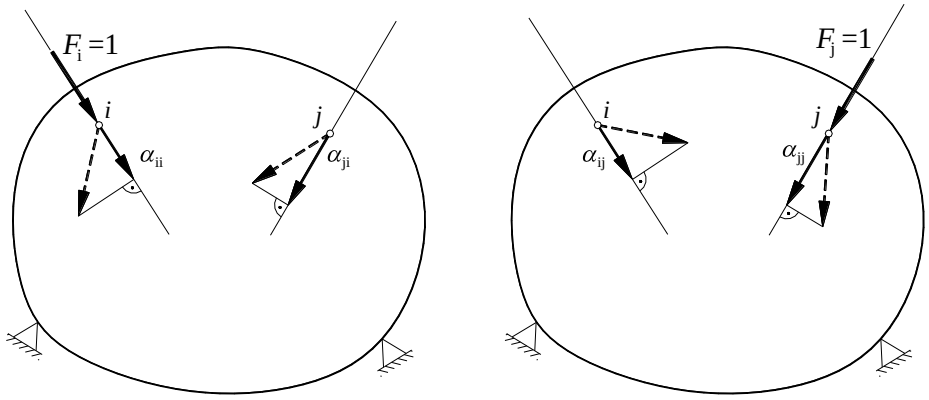
J. Brnić & G. Turkalj: *Nauka o čvrstoći II*, Zigo, Rijeka, 2006.

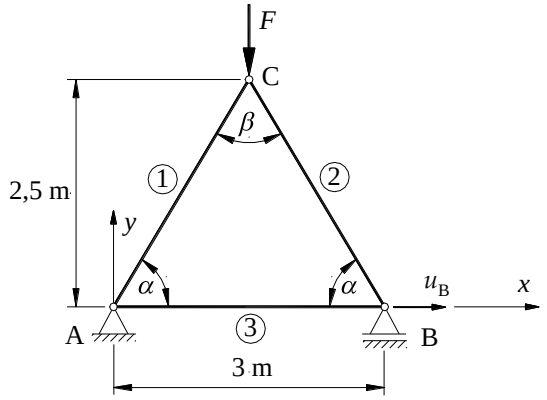
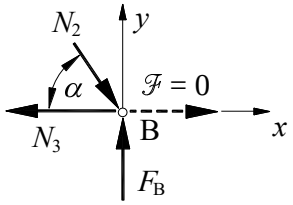
Datum zadnje promjene: 1. veljače 2021.

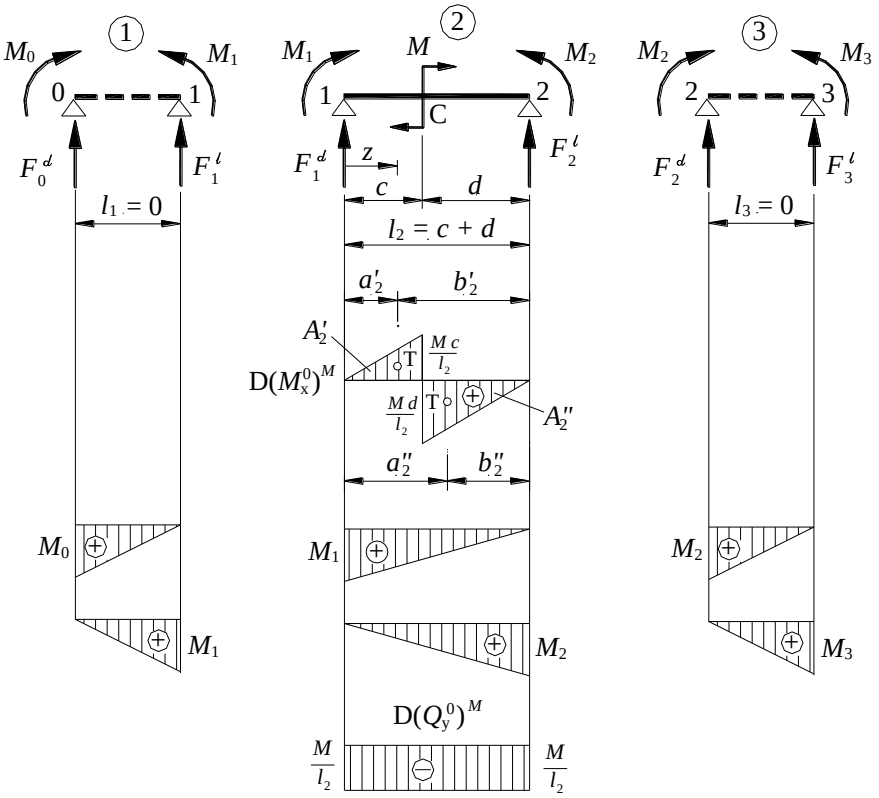
Redni broj	Broj stranice	Ispravak
1.	14	$x'_{\mathrm{T}} = \dfrac{\sum A_i x'_i}{\sum A_i} = \dfrac{A_1 x'_1 + A_2 x'_2}{A_1 + A_2} = \dfrac{715\cdot(-32{,}5) + 1254\cdot(-59{,}5)}{715 + 1254} = -49{,}7\ \mathrm{mm}$
2.	15	$I_{\mathrm{x}} = \ldots = 3144053{,}84\ \mathrm{mm}^4$
3.	25	
4.	26	$I_{\mathrm{x}} = I_2 = \dfrac{hb^3}{12} = \dfrac{b^4}{6}, \quad I_{\mathrm{y}} = I_1 = \dfrac{h^3 b}{12} = \dfrac{2b^4}{3}$
5.	27	$I_{\mathrm{x}} = \dfrac{0{,}091^4}{6} = 1{,}143\cdot10^{-5}\ \mathrm{m}^4, \quad I_{\mathrm{y}} = \dfrac{2\cdot0{,}091^4}{3} = 4{,}572\cdot10^{-5}\ \mathrm{m}^4$
6.	28	$v_{\mathrm{B}} = v_{\max} = \dfrac{5}{48}\dfrac{F_2 l^3}{E I_{\mathrm{x}}} = \dfrac{5\cdot800\cdot2^3}{48\cdot10\cdot10^9\cdot1{,}143\cdot10^{-5}} = 0{,}0047\ \mathrm{m} = 4{,}7\ \mathrm{mm}$

7.	29	
8.	33	Pošto je iz izraza (f) i (g), za $z = 0$:
9.	56	$a_x = -\dfrac{i_y^2}{x_o} = 1{,}33 \text{ cm}, \quad a_y = -\dfrac{i_x^2}{y_o} = 2 \text{ cm}$
10.	57	
11.	58	$M_x = F \cdot \lvert y_o \rvert = 200 \cdot 85 = 17000 \text{ kNmm}$ $M_y = F \cdot x_o = 200 \cdot 60 = 12000 \text{ kNmm}$
12.	63	$\sigma_{z\,\min} = \sigma_z^C = \ldots$

13.	65	... i momenta savijanja: $M_\mathrm{x} = M$. 
14.	69	$a_\mathrm{x} = -\dfrac{I_\mathrm{y}}{M_\mathrm{ymax}} \cdot \dfrac{F}{A} = -\dfrac{0{,}2667 \cdot 10^{-3} \cdot 100 \cdot 10^3}{5 \cdot 10^3 \cdot 0{,}08} = -0{,}0667\ \mathrm{m} = -66{,}7\ \mathrm{mm}$
15.	70	$a_\mathrm{y} = -\dfrac{I_\mathrm{x}}{\lvert M_\mathrm{x} \rvert_\mathrm{max}} \cdot \dfrac{F}{A} = -\dfrac{1{,}0667 \cdot 10^{-3} \cdot 100 \cdot 10^3}{92 \cdot 10^3 \cdot 0{,}08} = -0{,}0145\ \mathrm{m} = -14{,}5\ \mathrm{mm}$
16.	83	$\mathcal{W}^* = \int\limits_F \vec{s}_\mathrm{A} \cdot \mathrm{d}\vec{F} = \int\limits_F s\,\mathrm{d}F$
17.	84	$\mathcal{W} = \dfrac{1}{2}\left(\int\limits_{A_\sigma} \vec{t}_\mathrm{n} \cdot \vec{s}\,\mathrm{d}A_\sigma + \int\limits_V \vec{f}_\mathrm{v} \cdot \vec{s}\,\mathrm{d}V \right)$
18.	92	$\sigma_\mathrm{x} = \dfrac{E}{(1+\nu)(1-2\nu)} \left[(1-\nu)\varepsilon_\mathrm{x} + \nu\left(\varepsilon_\mathrm{y} + \varepsilon_\mathrm{z}\right) \right]$
19.	96	$\mathcal{U} = \dfrac{1}{2}\int\limits_V \tau\gamma\,\mathrm{d}V = \dfrac{1}{2G}\int\limits_V \tau^2\,\mathrm{d}V$
20.	98	$\mathcal{U} = \dfrac{1}{2}\sum\limits_{\mathrm{i}=1}^{\mathrm{n}} \dfrac{M_\mathrm{ti}^2 l_\mathrm{i}}{G_\mathrm{i} I_\mathrm{ti}} = \dfrac{1}{2}\sum\limits_{\mathrm{i}=1}^{\mathrm{n}} \dfrac{\varphi_\mathrm{i}^2 G_\mathrm{i} I_\mathrm{ti}}{l_\mathrm{i}}$
21.	101	

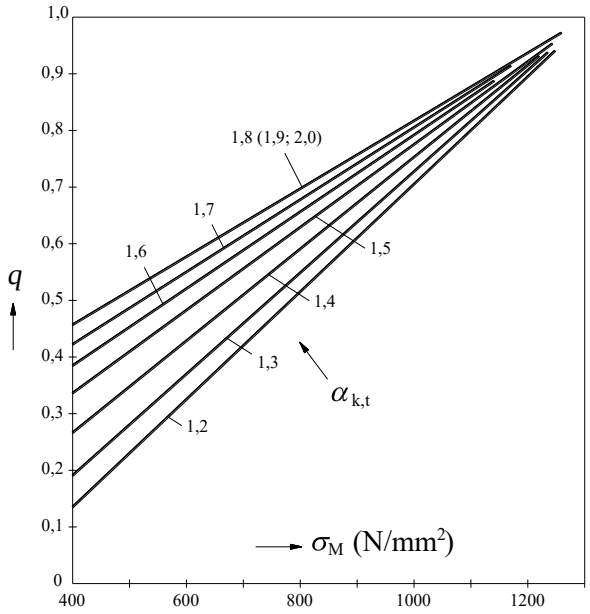
22.	102	$S_{\mathrm{y}} = A_2\, x_1 = h\left(\frac{b}{2} - x\right) \cdot \frac{1}{2}\left(\frac{b}{2} + x\right)$
23.	102	$k_{\mathrm{y}} = \frac{36}{h^5} \int_{-h/2}^{h/2} \left(\frac{h^2}{4} - y^2\right)^2 \mathrm{d}y = \frac{36}{h^5} \cdot \frac{h^5}{30} = \frac{6}{5} = 1{,}2 = k_{\mathrm{x}}$
24.	105	$\ldots = \frac{1}{2}\left(\frac{5774^2 \cdot 0{,}3}{200 \cdot 10^9 \cdot 0{,}1^2} + 2 \cdot \frac{6}{5} \cdot \frac{5774^2 \cdot 0{,}3}{80 \cdot 10^9 \cdot 0{,}1^2} + 2 \cdot \frac{5774^2 \cdot 0{,}3^3 \cdot 12}{3 \cdot 200 \cdot 10^9 \cdot 0{,}1^4} \right)$
25.	106	$\ldots + 2 \cdot \frac{5774^2 \cdot 0{,}3^3 \cdot 12}{3 \cdot 200 \cdot 10^9 \cdot 0{,}1^4} + 2 \cdot \frac{5774^2 \cdot 0{,}3^3 \cdot 12}{200 \cdot 10^9 \cdot 0{,}1^4} + \frac{5774^2 \cdot 0{,}3^3}{80 \cdot 10^9 \cdot 0{,}141 \cdot 0{,}1^4} \Bigg)$
26.	110	$\mathcal{U} = \frac{1}{2} F_{\mathrm{i}}\, s_{\mathrm{ii}} + \frac{1}{2} F_{\mathrm{i}}\, s_{\mathrm{ij}} + \frac{1}{2} F_{\mathrm{j}}\, s_{\mathrm{ji}} + \frac{1}{2} F_{\mathrm{j}}\, s_{\mathrm{jj}}$
27.	113	
28.	120	$\delta \mathcal{W}_{\mathrm{ext}} + \delta \mathcal{W}_{\mathrm{int}} = 0$
29.	125	$\delta \mathcal{U} = EA \int_0^l \frac{w_{\mathrm{B}}}{l} \cdot \frac{\delta w_{\mathrm{B}}}{l}\, \mathrm{d}z = \frac{EA}{l^2}\, w_{\mathrm{B}} \int_0^l \mathrm{d}z\, \delta w_{\mathrm{B}}$
30.	131	$\mathcal{U} = \frac{EA}{2h}\left(\Delta l_1^2 \cdot \sin\alpha + \Delta l_2^2 \cdot \sin\beta\right)$
31.	132	$\delta\Pi = \delta \mathcal{U} - \left(\sum_{\mathrm{i}=1}^{\mathrm{n}} F_{\mathrm{i}}\, \delta s_{\mathrm{i}} + \sum_{\mathrm{j}=1}^{\mathrm{m}} M_{\mathrm{j}}\, \delta\varphi_{\mathrm{j}} \right) = 0$
32.	133	$\delta\Pi^* = \delta \mathcal{U}^* - \left(\sum_{\mathrm{i}=1}^{\mathrm{n}} s_{\mathrm{i}}\, \delta F_{\mathrm{i}} + \sum_{\mathrm{j}=1}^{\mathrm{m}} \varphi_{\mathrm{j}}\, \delta M_{\mathrm{j}} \right) = 0$
33.	134	Izraz (3.136) naziva se *drugi Castiglianov teorem*, koji glasi:
34.	139	Zadano: Q = 10 kN, ...

35.	140	$v_{\mathrm{C}} = \dfrac{2 \cdot 10 \cdot 10^{3} \cdot 3}{100 \cdot 10^{-4} \cdot 210 \cdot 10^{9}} = \ldots$
36.	144	$l_1 = \dfrac{200}{\tan 60^{\circ}} = 115{,}5 \text{ cm}, \quad l_2 = \dfrac{200}{\sin 60^{\circ}} = 230{,}9 \text{ cm}$
37.	145	$v_{\mathrm{C}} = \dfrac{1}{2{,}1 \cdot 10^{4} \cdot 5}\left(\dfrac{20}{\sqrt{3}} \cdot \dfrac{1}{\sqrt{3}} \cdot 115{,}5 + \dfrac{2}{\sqrt{3}} \cdot 20 \cdot \dfrac{2}{\sqrt{3}} \cdot 230{,}9 \right)$
38.	145	
39.	146	
40.	150	$v_{\mathrm{B}} = \dfrac{1}{EI_{\mathrm{x}}} \int_{0}^{l} M_{\mathrm{x}} M_{\mathrm{ox}} \, \mathrm{d}z$
41.	152	... Zadano: F, l, $EI_{\mathrm{x}} = \text{const.}$
42.	152	$M_{\mathrm{x1}} = F_{\mathrm{A}} \cdot z_1 = \dfrac{F}{2} \cdot z_1, \quad \dfrac{\partial M_{\mathrm{x1}}}{\partial F} = \dfrac{z_1}{2}$, $M_{\mathrm{x2}} = F_{\mathrm{B}} \cdot z_2 = \dfrac{F}{2} \cdot z_2 = M_{\mathrm{x1}}, \quad \dfrac{\partial M_{\mathrm{x2}}}{\partial F} = \dfrac{z_2}{2} = \dfrac{\partial M_{\mathrm{x1}}}{\partial F}$
43.	153	$I_{\mathrm{x}} = 2 \cdot 10^{-5} \text{ m}^4$
44.	166	*Vertikalni pomak:* $\ldots, \quad \dfrac{\partial M_2}{\partial F} = -L$
45.	170	Za okvirni nosač prikazan na sl. 3.54a, primjenom Mohrove metode odrediti za koliko se međusobno primaknu presjeci A i B.
46.	174	$\sum M_{\mathrm{B}} = 0 \quad \rightarrow \quad F_{\mathrm{A}} l + M_{\mathrm{B}} = \dfrac{q l^2}{2}$

47.	177	$F_{\mathrm{B}} = \dfrac{5}{8} q l, \quad M_{\mathrm{B}} = \dfrac{q l^2}{8}$
48.	182	$-12F_{\mathrm{Cx}} + 32F_{\mathrm{Cy}} + 3F = 0 \qquad$ (g)
49.	185	$v_{\mathrm{C}} = \dfrac{F}{EI_{\mathrm{x}}}\left(\dfrac{a^2}{l^2}\displaystyle\int_0^l z_1^2\,\mathrm{d}z + \int_0^a z_2^2\,\mathrm{d}z\right) = \dfrac{F a^2}{3EI_{\mathrm{x}}}(a+l) \qquad$ (d)
50.	185	$F = \dfrac{\alpha_{\mathrm{t}}\Delta t h E}{\dfrac{a^2}{3I_{\mathrm{x}}}(a+l)+\dfrac{h}{A}} = \dfrac{1{,}25\cdot10^{-5}\cdot40\cdot1{,}5\cdot200\cdot10^{9}}{\dfrac{1}{3\cdot1{,}626\cdot10^{-6}}(1+2)+\dfrac{1{,}5}{5\cdot10^{-4}}} \approx 243\ \mathrm{N}$
51.	204	... otporni moment poprečnoga presjeka grede, ako je σ_{dop} = 180 Mpa.
52.	212	$z = l_2 = 2\ \mathrm{m} \;\rightarrow\; M_{\mathrm{x}} = M_2 = 0{,}0357\ \mathrm{kNm}$
53.	216	$z = 0 \;\rightarrow\; Q_{\mathrm{y}} = Q_0^{d} = \dfrac{F_2 c}{b+c} - \dfrac{M_0}{b+c} + \dfrac{M_1}{b+c} = \dfrac{20\cdot3+10-13{,}22}{2+3} = 11{,}356\ \mathrm{kN} = F_0^{d},$
54.	219	 **Slika 4.19.** Dekompozicija grednog nosača iz primjera 4.5
55.	222	Dekompozicijom okvirnog nosača prikazana je na sl. 4.21, pri čemu su osloncima sada pridružene sljedeće oznake: 0 ≡ A; 1 ≡ B; 2 ≡ C; 3 ≡ D.

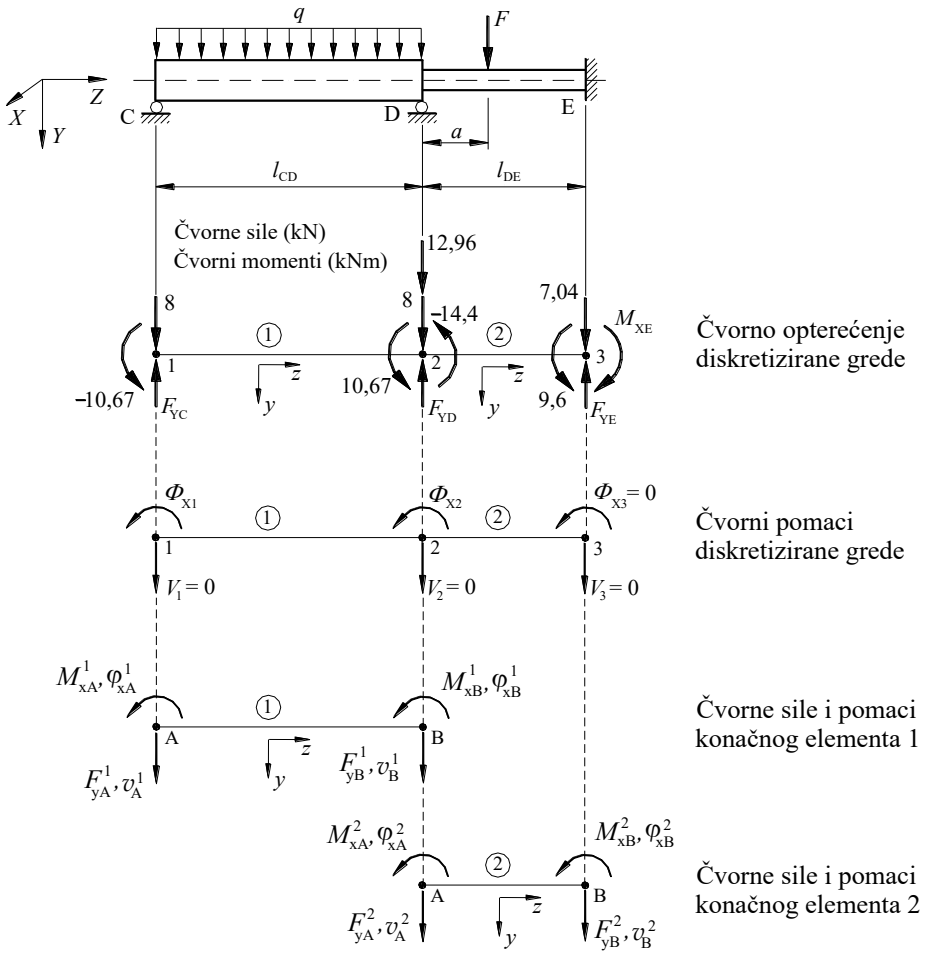
56.	227	$$\sigma_{\text{ekv}} = \frac{1-\nu}{2}\sigma_{\text{z}} \pm \frac{1+\nu}{2}\sqrt{\sigma_{\text{z}}^2 + 4\tau^2} \le \sigma_{\text{dop}}$$
57.	234	Međutim, kako tangencijalno naprezanje u tim točkama nije jednako, tj. Za $b < h$ u točkama B i D iznosi: $$\tau^{\text{B}} = \tau^{\text{D}} = \tau_{\max} = \frac{M_{\text{t}}}{W_{\text{t}}}, \quad W_{\text{t}} = \alpha b^2 h, \quad \alpha = \alpha\left(h/b\right), \qquad \text{(j)}$$ dok je u točkama A i C: $$\tau^{\text{A}} = \tau^{\text{C}} = \gamma\,\tau_{\max}, \quad \gamma = \gamma\left(h/b\right), \qquad \text{(k)}$$
58.	239	... s obzirom na tangencijalna naprezanja, najveća vrijednost kojih se javlja u točkama 2 ili 4 poprečnoga presjeka, te usvojimo ...
59.	245	... pa iz izraza (5.10b) dobivamo da je vrijednost ekvivalentnog momenta prema von Misesovoj teoriji: $$M_{\text{ekv}} = \sqrt{1{,}1405^2 + 0{,}75 \cdot 0{,}75^2} = 1{,}3125\ \text{kNm}$$
60.	258	$$\tau_{\max} = \tau_{\text{B}} = \tau^{Q} + \tau^{M_{\text{y}}} = \frac{4}{3}\frac{Q}{A} + \frac{M_{\text{y}}}{W_{\text{p}}}$$
61.	260	$$\tau_{\max} = \tau_{\text{B}} = \tau^{Q} + \tau^{M_{\text{y}}}$$
62.	266	... pa je, prema izrazu (6.23), potreban promjer žice opruge: ...
63.	267	Kako je $R/r < 10$, tada primjenom von Misesove teorije te izraza (6.6) i (6.7), dobivamo: $$\sigma_{\text{ekv}} = \frac{F_{\text{op}}}{r^2\pi}\sqrt{\left(1+\frac{4R}{r}\right)^2 \sin^2\beta + 12\left(\frac{2}{3}+\frac{R}{r}\right)^2 \cos^2\beta} \le \sigma_{\text{dop}}$$ $$F_{\text{op}} \le \frac{\sigma_{\text{dop}}\, r^2\pi}{\sqrt{\left(1+\frac{4R}{r}\right)^2 \sin^2\beta + 12\left(\frac{2}{3}+\frac{R}{r}\right)^2 \cos^2\beta}}$$ $$F_{\text{op}} \le \frac{600 \cdot 10^6 \cdot 0{,}01^2 \cdot \pi}{\sqrt{\left(1+\frac{4\cdot 4}{1}\right)^2 \sin^2 15^{\text{o}} + 12\left(\frac{2}{3}+\frac{4}{1}\right)^2 \cos^2 15^{\text{o}}}} = 11619\ \text{N}.$$
64.	268	$$\delta_{\text{op}} = 11619 \cdot 0{,}04^2 \cdot 2{,}6 \cdot \left(\frac{\cos^2 15^{\text{o}}}{80 \cdot 10^9 \cdot 1{,}5708 \cdot 10^{-8}} + \frac{\sin^2 15^{\text{o}}}{200 \cdot 10^9 \cdot 7{,}854 \cdot 10^{-9}} \right) = 0{,}038\ \text{m}.$$
65.	268	$$k = \frac{F_{\text{op}}}{\delta_{\text{op}}} = \frac{11619}{0{,}038} = 305951\,\frac{\text{N}}{\text{m}} \approx 3060\,\frac{\text{N}}{\text{cm}}$$

66.	301	$\sigma_{\varphi(1)} = \frac{F}{A} - \frac{M^F}{S_x} \cdot \frac{y_1}{r_u} = \frac{8}{24} + \frac{200}{17,28} \cdot \frac{3,28}{4}$ ⋮ $\sigma_{\varphi(2)} = \frac{F}{A} - \frac{M}{S_x} \cdot \frac{y_2}{r_v} = \frac{8}{24} - \frac{200}{17,28} \cdot \frac{4,72}{12}$
67.	302	$y_T = \frac{h}{3} \cdot \frac{b_1 + 2b_2}{b_1 + b_2} = 3,48\,\text{cm}$
68.	306	$\varphi = 30^o \quad \rightarrow \quad Q_\varphi = \frac{\sqrt{3}}{2} F^q = \frac{\sqrt{3}}{2} \cdot 2,5 = 2,165\,\text{kN}$
69.	307	$\varphi = 30^o \quad \rightarrow \quad N_\varphi = -\frac{F_q}{2} = -\frac{2,5}{2} = -1,250\,\text{kN}$
70.	308	$\sigma_{z\,max} = \frac{M_{\varphi\,max}}{W_x} \le \sigma_{dop}, \quad W_x = \frac{b h^2}{6} = \frac{2b^3}{3}$
71.	317	$r_n = \frac{h}{\ln \frac{r_v}{r_u}} = \frac{10}{\ln \frac{105}{95}} = 99,917\,\text{cm}$
72.	319	$\alpha_A = \frac{M R \pi}{4 E I_x}$
73.	326	$\varphi = \pi/2 : \ldots$
74.	328	➢ $\varphi = 90^o$: $M_\varphi = -0,182 FR, \quad Q_\varphi = 0,5F, \quad N_\varphi = -\frac{F}{\pi} = -0,318F$
75.	329	$N_\varphi = -0,593F$
76.	330	$v_B = \frac{\partial \mathcal{U}}{\partial B_y} = \frac{1}{EI} \left(\int_0^\pi M_{\varphi 1} \frac{\partial M_{\varphi 1}}{\partial B_y} R\,\mathrm{d}\varphi + \int_0^h M_2 \frac{\partial M_2}{\partial B_y} \mathrm{d}y \right) = 0$
77.	331	$M_2 = B_y \cdot 2R + B_x y - \frac{q y^2}{2}, \quad \frac{\partial M_2}{\partial B_y} = 2R$
78.	333	…sile F_A i F_C ekvivalentne normalnim silama u presjecima A i C, dok su moment M_A i M_C ekvivalentni…

79.	352	
80.	374	... masa štapa OA ($m = \rho A l$), ...
81.	378	$M_A R \frac{\pi}{2} - \frac{1}{8} \rho A R^4 \omega^2 \pi = 0$
82.	379	$\omega_{max} \leq \sqrt{\frac{\sigma_{dop}\, d}{2\rho R^3}} = \sqrt{\frac{200 \cdot 10^6 \cdot 0{,}02}{2 \cdot 7850 \cdot 0{,}3^3}} \approx 97\ \mathrm{s}^{-1}$
83.	380	... iz izraza (a) i (b) u izraz (8.21), ...
84.	382	... izraza (i) i (m) u izraz (8.21), ...
85.	384	Dinamički (udarni) faktor, izraz (8.23), ...
86.	385	$\Delta l_{din} = 0{,}97 \cdot 10^{-6} \cdot 204{,}07 = 1{,}98 \cdot 10^{-4}\ \mathrm{m} = 0{,}198\ \mathrm{mm}$
87.	386	$\sigma_{2st} = \frac{F_B}{A_2} = \ldots$
88.	386	$\Delta l_{1st} = \ldots = 2{,}5 \cdot 10^{-5}\ \mathrm{cm}$
89.	386	$\Delta l_{2st} = \Delta l_{1st} = 2{,}5 \cdot 10^{-5}\ \mathrm{cm}$
90.	389	...ako je pri tome izazvao dinamičko naprezanje $\sigma_{din} = 100$ MPa te dinamički progib slobodnoga kraja.
91.	391	... teret težine Q = 8000 N s visine H = 2 cm. Grede su izrađene ...
92.	394	Zbog produljenja užeta za Δl_{din}, u njemu ...

93.	396	$\frac{\rho}{d}=\frac{10}{90}=0,111$ i $\frac{D}{d}=\frac{110}{90}=1,22$
94.	396	$\sigma_{-1,\,\mathrm{dop}}^{\mathrm{d,\,f,\,stv}}=\frac{\sigma_{-1}^{\mathrm{d,\,f,\,stv}}}{f_{\mathrm{s}}}=\frac{88,47}{2}=44,235\ \mathrm{MPa}$
95.	396	$\sigma_{\max}=\frac{M_{\mathrm{f\,max}}}{W_{\mathrm{x}}}\le\sigma_{-1,\,\mathrm{dop}}^{\mathrm{d,\,f,\,stv}},\quad M_{\mathrm{f\,max}}=M_{\mathrm{x\,max}}$
96.	397	$\tau_{\max}=54,71\ \mathrm{N/mm^2}\ \left(=\mathrm{MPa}\right)$
97.	397	... dobiveno naprezanje $\tau_{\max}=54,71$ MPa, koje je izmjenično ...
98.	398	... vrijednost naprezanja $\tau_{\max}=54,71$ MPa, kojeg uzrokuje ...
99.	398	... promjera $D=40$ mm, koji ima poluokrugli prstenasti žljeb ...
100.	398	... u kombinaciji sa sl. 8.8c, koja daje slične podatke i za aksijalno opterećenje, uzeti da je:
101.	399	Prema sl. 8.11 za vrijednost $d=32$ mm i krivulje za legirane čelike, slijedi: $\alpha_{\mathrm{p}}=1,4$. Sada je prema izrazu (8.20): $\sigma_{-1}^{\mathrm{d,\,a,\,stv}}=\frac{\sigma_{-1}^{\mathrm{d,\,a}}}{\alpha_{\mathrm{k,ef}}\,\alpha_{\mathrm{p}}}=\frac{320}{1,74\cdot1,4}=131,36\ \mathrm{N/mm^2},$ $\sigma_{-1,\mathrm{dop}}^{\mathrm{d,\,a,\,stv}}=\frac{131,36}{1,8}=72,98\ \mathrm{N/mm^2}.$ Maksimalna je sila ova: $F_{\max}=\sigma_{-1,\mathrm{dop}}^{\mathrm{d,\,a,\,stv}}\cdot A=72,98\cdot\frac{32^2\cdot\pi}{4}.$ $F_{\max}=58692\ \mathrm{N}\approx59\ \mathrm{kN}.$
102.	414	$u_1=\frac{p_{\mathrm{d}}r_2^2}{E\left(r_2^2-r_1^2\right)}\left[\left(1-\nu\right)r_2+\left(1+\nu\right)\frac{r_1^2}{r_2^2}\right]$
103.	421	...pa unošenjem vrijednosti (9.69) u izraz (9.72), slijedi:
104.	423	$u=\Delta r_1=\frac{150\cdot2^2}{72000\left(800^2-200^2\right)}\left[\left(1-0,33\right)\cdot200+\left(1+0,33\right)\cdot\frac{800^2}{200}\right]-$ $-\frac{0,33}{72000}\cdot10\cdot200$
105.	424	Koeficijent toplinskog rastezanja $\alpha_{\mathrm{t}}=125\cdot10^{-7}$ 1/°C, $E=200$ GPa, unutarnji pritisak $p_1=300$ MPa.

106.	425	$$p_{\mathrm{d}} = \frac{0{,}072 \cdot 200\,000 \cdot \left(50^2 - 25^2\right)\left(25^2 - 10^2\right)}{2 \cdot 25^3 \cdot \left(50^2 - 10^2\right)}$$
107.	426	$$\Delta t = \frac{u}{r\,\alpha_{\mathrm{t}}} = T_2 - T_1 = \frac{0{,}072 + 0{,}025}{25 \cdot 125 \cdot 10^{-7}} = 310{,}4\ ^{\circ}\mathrm{C}$$
108.	451	$$M_{\mathrm{x}}\left(a, \frac{b}{2}\right) = \beta_1\, p\, a^2 \qquad (10.47)$$
109.	451	$$M_{\mathrm{y}}\left(\frac{a}{2}, b\right) = \beta_2\, p\, a^2 \qquad (10.48)$$
110.	463	**Slika 10.31.** Ravnoteža diferencijalnog elementa ljuske: a) aksonometrijski prikaz; b) presjek ravninom okomitom na os ljuske; c) presjek elementa ravninom koja prolazi kroz os *z* ljuske
111.	495	$$p_{\max} = \frac{3F}{2\pi a^2}$$
112.	524	Budući da LEFM zanemaruje činjenicu postojanja plastične zone u vrhu ...
113.	539	... (ili K_{IIc}, ili K_{IIIc}) ...
114.	555	Neka je krivulja rasta centrične pukotine u ploči, izrađene iz aluminijske legure, dana na sl. 12.25. Širina ploče je takva da je $a \ll b$. Potrebno je:
115.	569	$$\Pi = \frac{E I_{\mathrm{x}}}{2} c_1^2 \int_0^l \left(\frac{\mathrm{d}^2 \phi_1}{\mathrm{d}z^2}\right)^2 \mathrm{d}z - q\, c_1 \int_0^l \phi_1 \mathrm{d}z$$
116.	577	$$\mathcal{R}(z) = E I_{\mathrm{x}} \sum_{\mathrm{i}=1}^{\mathrm{i}=\mathrm{n}} c_{\mathrm{i}} \cdot \frac{\mathrm{d}^2 \psi_{\mathrm{i}}(z)}{\mathrm{d}z^2} + \frac{qz}{2}(l - z)$$
117.	577	$$\int_0^l \left[E I_{\mathrm{x}} \sum_{\mathrm{i}=1}^{\mathrm{i}=\mathrm{n}} c_{\mathrm{i}} \cdot \frac{\mathrm{d}^2 \psi_{\mathrm{i}}(z)}{\mathrm{d}z^2} + \frac{qz}{2}(l - z) \right] \cdot \psi_{\mathrm{j}}(z)\, \mathrm{d}z = 0, \quad (\mathrm{j} = 1,\ 2, \ldots,\ \mathrm{n}) \qquad \text{(b)}$$
118.	579	$$\mathcal{R}(z) = E I_{\mathrm{x}} \sum_{\mathrm{i}=1}^{\mathrm{i}=\mathrm{n}} c_{\mathrm{i}} \cdot \frac{\mathrm{d}^2 \psi_{\mathrm{i}}(z)}{\mathrm{d}z^2} + F_{\mathrm{kr}} \sum_{\mathrm{i}=1}^{\mathrm{i}=\mathrm{n}} c_{\mathrm{i}} \cdot \psi_{\mathrm{i}}(z) \qquad \text{(b)}$$
119.	579	$$\int_0^l \left[E I_{\mathrm{x}} \sum_{\mathrm{i}=1}^{\mathrm{i}=\mathrm{n}} c_{\mathrm{i}} \cdot \frac{\mathrm{d}^2 \psi_{\mathrm{i}}(z)}{\mathrm{d}z^2} + F_{\mathrm{kr}} \sum_{\mathrm{i}=1}^{\mathrm{i}=\mathrm{n}} c_{\mathrm{i}} \cdot \psi_{\mathrm{i}}(z) \right] \cdot \psi_{\mathrm{j}}(z)\, \mathrm{d}z = 0, \quad (\mathrm{j} = 1,\ 2, \ldots,\ \mathrm{n}) \quad \text{(c)}$$
120.	586	$$z = l, \quad v(l) = \frac{1}{3} \frac{F l^3}{E I_{\mathrm{x}}}$$
121.	594	$$P_{\mathrm{n}}(x) = \alpha_1 + \alpha_2 x + \alpha_3 x^2 + \ldots = \sum_{\mathrm{i}=0}^{\mathrm{n}} \alpha_{\mathrm{i}+1}\, x^{\mathrm{i}}$$
122.	617	$$\left[B_{\varphi}\right] = \frac{\mathrm{d}}{\mathrm{d}z}\left[N_{\varphi}\right] = \begin{bmatrix} -\frac{1}{l} & \frac{1}{l} \end{bmatrix}$$

123.	617	$$\int_0^l GI_t \frac{\mathrm{d}\varphi_z}{\mathrm{d}z}\frac{\mathrm{d}\delta\varphi_z}{\mathrm{d}z}\mathrm{d}z = GI_t\int_0^l \frac{\mathrm{d}\delta\varphi_z}{\mathrm{d}z}\frac{\mathrm{d}\varphi_z}{\mathrm{d}z}\mathrm{d}z = \left\{\delta u_\varphi^e\right\}^T GI_t\int_0^l \left[B_\varphi\right]^T\left[B_\varphi\right]\mathrm{d}z\left\{u_\varphi^e\right\} =$$ $$= \left\{\delta u_\varphi^e\right\}^T \frac{GI_t}{l^2}\int_0^l \begin{bmatrix}-1\\1\end{bmatrix}\begin{bmatrix}-1 & 1\end{bmatrix}\mathrm{d}z\left\{u_\varphi^e\right\} = \left\{\delta u_\varphi^e\right\}^T\left[k_\varphi^e\right]\left\{u_\varphi^e\right\},$$ (13.107)
124.	624	$$\delta\varphi_x = -\frac{\mathrm{d}\delta v_0}{\mathrm{d}z} = -\frac{\mathrm{d}}{\mathrm{d}z}\left[N_v\right]\left\{\delta u_v^e\right\},$$ (13.124) gdje je matrica $\left[N_v\right]$ dana izrazom (13.84).
125.	624	$$\left\{f_{ekv}^e\right\} = \left\{f_{ekv}^M\right\} = -M\left(\frac{\mathrm{d}}{\mathrm{d}z}\left[N_v\right]^T\right)_{z=a}$$
126.	633	...konstantnim linijskim opterećenjem $q = 2$ kN/m. Uporabom...
127.	634	
128.	637	$$\left\{U_m\right\} = \begin{Bmatrix}\Phi_{X1}\\ \Phi_{X2}\end{Bmatrix} = \begin{Bmatrix}-568{,}116\\ 69{,}565\end{Bmatrix}\cdot 10^{-3}\ \text{rad}$$
129.	640	..., dobit ćemo točku infleksije elastične linije segmenta D-E samo u presjeku $z = 1{,}33$ m, ...