

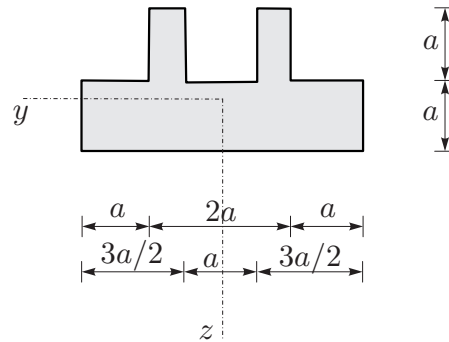
Vpisna številka: 261 \_ \_ \_ \_ \_

naloga	točk
1	
2	
3	

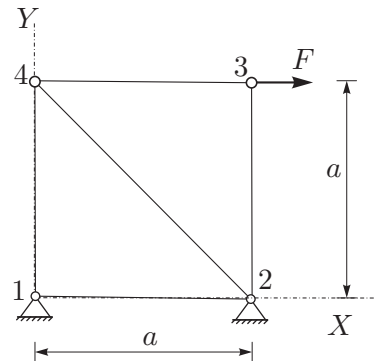
TRDNOST (OG-VSŠ) - 3. KOLOKVIJ (25. 01. 2013)

Pazljivo preberite besedilo vsake naloge!  
Pišite čitljivo! Uspešno reševanje!

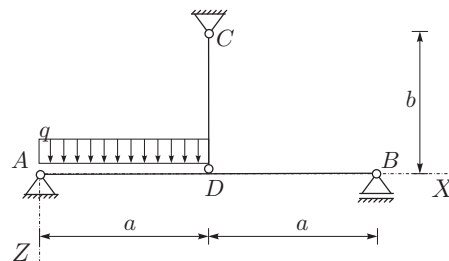
1. Prerez na sliki je obremenjen s prečno silo  $N_z = 10 \text{ kN}$ . Določite in narišite potek strižnih napetosti  $\sigma_{xz}$  po prerezu! (25%)  
Podatki:  $a = 10 \text{ cm}$ .



2. Za paličje smo že določili pomike vozlišč. Določite še osne sile v paličah in reakcije podpor! (25%)  
Podatki:  $a = 3 \text{ m}$ ,  $F = 1 \text{ MN}$ ,  
 $E = 2 \cdot 10^5 \text{ MPa}$ ,  $A = 0.02 \text{ m}^2$ ,  
 $u_3 = 0.00362 \text{ m}$ ,  $w_3 = 0.0 \text{ m}$ ,  
 $u_4 = 0.00287 \text{ m}$ ,  $w_4 = 0.00075 \text{ m}$ .



3. Za konstrukcijo na sliki izračunajte notranje statične količine po metodi sil! Določite tudi navpični pomik v točki D! Pri upogibno obremenjenih nosilcih upoštevajte samo vpliv upogibnih momentov na deformiranje. (50%)  
Podatki:  $a = 3 \text{ m}$ ,  $b = 2 \text{ m}$ ,  $q = 10 \text{ kN/m}$ ,  
 $E = 20000 \text{ kN/cm}^2$ ,  
 $A_x = 150 \text{ cm}^2$ ,  $I_y = 1250 \text{ cm}^4$ .



In[35]=

```
a = 10  
GeometrijskeKarakteristike[{{-a/2, 0}, {-a/2, a}, {a/2, a}, {a/2, 0}, {a, 0}, {a, a},  
{2a, a}, {2a, 2a}, {-2a, 2a}, {-2a, a}, {-a, a}, {-a, 0}, {-a/2, 0}}]
```

Out[35]= 10

Ax = 500.

Sy = 6500.

Sz = 0.

YT = 0.

zT = 13.

IY = 96 666.7

Iz = 59 166.7

Iyz = 0.

IY<sup>T</sup> = 12 166.7

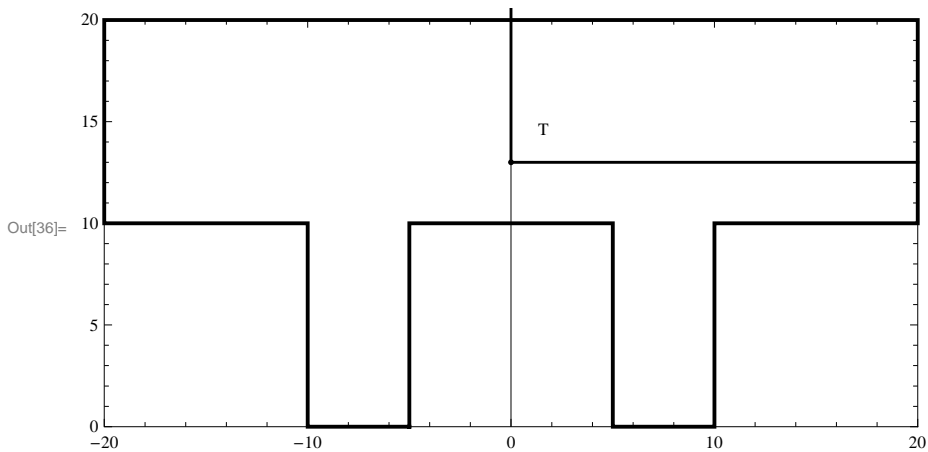
Iz<sup>T</sup> = 59 166.7

Iyz<sup>T</sup> = 0.

α<sub>G</sub> = 0.

I1 = 12 166.7

I2 = 59 166.7



In[60]=

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zT = 13  
IyT = I1  
Nz = 10 000
```

Out[60]= 13

Out[61]= 12 166.7

Out[62]= 10 000

In[53]=

```

S1 = StaticniMomentY[{{-a/2, -zT}, {-a/2, z}, {a/2, z},
  {a/2, -zT}, {a, -zT}, {a, z}, {-a, z}, {-a, -zT}, {-a/2, -zT}}]
S1 /. z -> -zT
S1 /. z -> a - zT
S2 = StaticniMomentY[{{-a/2, -zT}, {-a/2, a - zT},
  {a/2, a - zT}, {a/2, -zT}, {a, -zT}, {a, a - zT}, {2a, a - zT}, {2a, z},
  {-2a, z}, {-2a, a - zT}, {-a, a - zT}, {-a, -zT}, {-a/2, -zT}}]
S2 /. z -> a - zT
S2 /. z -> 0
S2 /. z -> 2a - zT

```

Out[53]=  $5(-169 + z^2)$ 

Out[54]= 0

Out[55]= -800

Out[56]=  $20(-49 + z^2)$ 

Out[57]= -800

Out[58]= -980

Out[59]= 0

In[63]=  $\sigma_{xz1} = N[Nz / I_{yT} * 800] / a$ 

Out[63]= 65.7534

In[64]=  $\sigma_{xz2} = N[Nz / I_{yT} * 800] / 4 / a$ 

Out[64]= 16.4384

In[65]=  $\sigma_{xz3} = N[Nz / I_{yT} * 900] / 4 / a$ 

Out[65]= 18.4932

In[78]=

```

 $\sigma_{xz1} = -N[Nz / I_{yT} * S1] / a;$ 
 $\sigma_{xz2} = -N[Nz / I_{yT} * S2] / 4 / a;$ 
p1 = Plot[ $\sigma_{xz1}$ , {z, -zT, a - zT}];
p2 = Plot[ $\sigma_{xz2}$ , {z, a - zT, 2a - zT}];
Show[p1, p2, PlotRange -> All]

```

Out[82]=

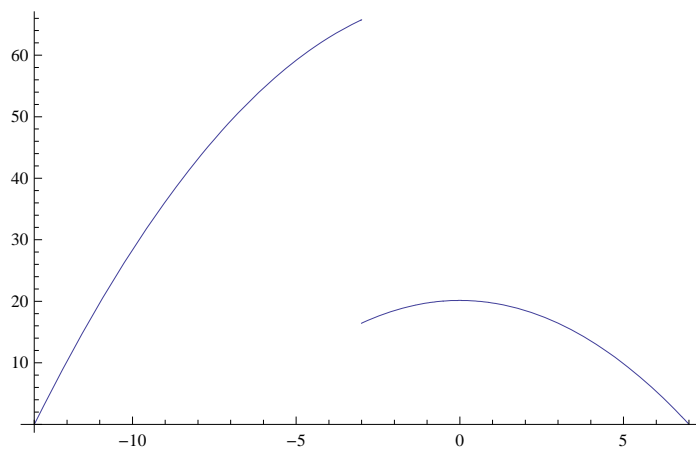


TABELA DOLŽIN, KOSINUSOV IN OSNIH TOGOSTI ZA PODANO PALIČJE

palica	vozel1	vozel2	dolzina	cos(a_ij)	cos(b_ij)	k_ij
1	1	2	3.000	1.000	0.000	1333.333
2	1	4	3.000	0.000	1.000	1333.333
3	2	3	3.000	0.000	1.000	1333.333
4	2	4	4.243	-0.707	0.707	942.809
5	3	4	3.000	-1.000	0.000	1333.333

TOGOSTNA MATRIKA PALIČJA

-1333.333	0.000	1333.333	0.000	0.000	0.000	0.000	0.000
0.000	-1333.333	0.000	0.000	0.000	0.000	0.000	1333.333
1333.333	0.000	-1804.738	471.405	0.000	0.000	471.405	-471.405
0.000	0.000	471.405	-1804.738	0.000	1333.333	-471.405	471.405
0.000	0.000	0.000	0.000	-1333.333	0.000	1333.333	0.000
0.000	0.000	0.000	1333.333	0.000	-1333.333	0.000	0.000
0.000	0.000	471.405	-471.405	1333.333	0.000	-1804.738	471.405
0.000	1333.333	-471.405	471.405	0.000	0.000	471.405	-1804.738

POMIKI IN REAKCIJE VOZLIŠČ DANEGA PALIČJA

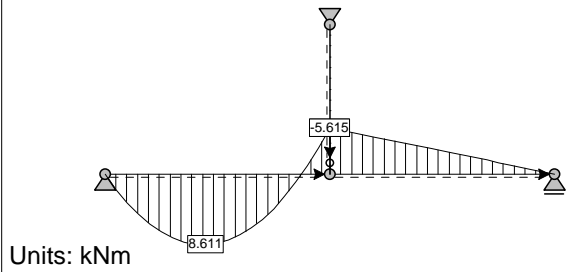
vozel	u_x	u_y	R_x	R_y
1	0.00000	0.00000	0.000	-1.000
2	0.00000	0.00000	-1.000	1.000
3	0.00362	0.00000		
4	0.00287	0.00075		

TABELA OSNIH SIL ZA PODANO PALIČJE

palica	vozel1	vozel2	N_ij
1	1	2	0.000
2	1	4	1.000
3	2	3	0.000
4	2	4	-1.414
5	3	4	1.000

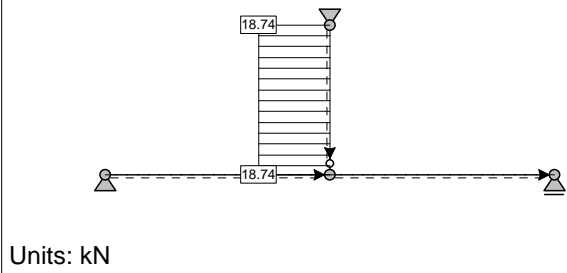
### LC1: Load case 2: Bending Moments My

1.00 Action 1



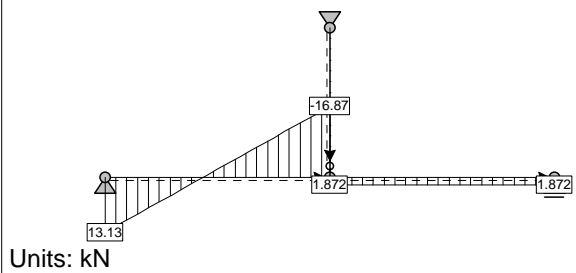
### LC1: Load case 2: Axial Forces Fx

1.00 Action 1



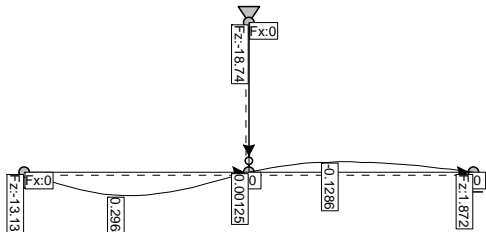
### LC1: Load case 2: Shear Forces Fz

1.00 Action 1



### LC1: Load case 2: Displacements and Reactions

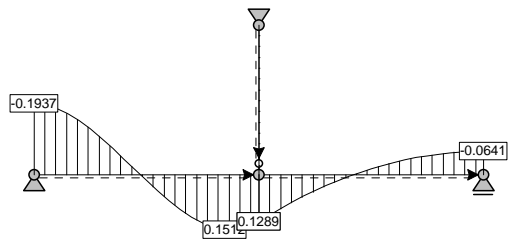
1.00 Action 1



Units: cm, kN, kNm

### LC1: Load case 2: Rotations

1.00 Action 1



Units: deg