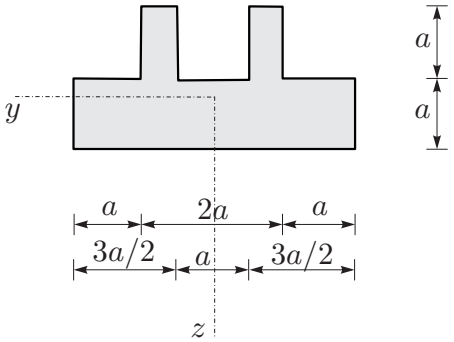
Vpisna številka: 261 _ _ _ _ _

naloga	točk
1	
2	
3	

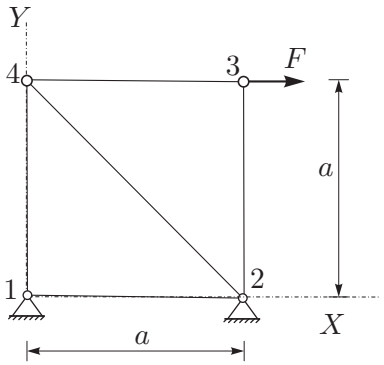
TRDNOST (OG-VSŠ) - 3. KOLOKVIJ (25. 01. 2013)

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

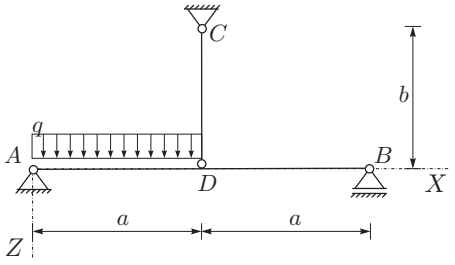
1. Prerez na sliki je obremenjen s prečno silo $N_z = 10\,\mathrm{kN}$. Določite in narišite potek strižnih napetosti σ_{xz} po prerezu! (25%)
Podatki: $a = 10\,\mathrm{cm}$.



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



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: $a = 3\,\mathrm{m}$, $b = 2\,\mathrm{m}$, $q = 10\,\mathrm{kN/m}$,
$E = 20000\,\mathrm{kN/cm}^2$,
$A_x = 150\,\mathrm{cm}^2$, $I_y = 1250\,\mathrm{cm}^4$.



In[35]:=

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

Out[35]= 10

Ax = 500.

Sy = 6500.

Sz = 0.

y_T = 0.

z_T = 13.

Iy = 96 666.7

Iz = 59 166.7

Iyz = 0.

Iy^T = 12 166.7

Iz^T = 59 166.7

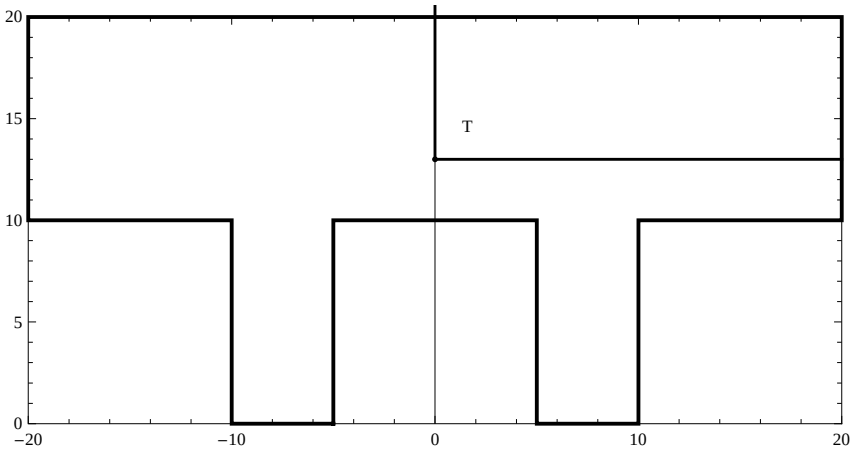
Iyz^T = 0.

α_G = 0.

I1 = 12 166.7

I2 = 59 166.7

Out[36]=



In[60]:=

```
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}, {2 a, a - zT}, {2 a, z},
    {-2 a, z}, {-2 a, a - zT}, {-a, a - zT}, {-a, -zT}, {-a / 2, -zT}}]
S2 /. z → a - zT
S2 /. z → 0
S2 /. z → 2 a - zT
```

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

Out[54]= 0

Out[55]= −800

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

Out[57]= −800

Out[58]= −980

Out[59]= 0

In[63]:=
```
σxz1 = N[Nz / IyT * 800] / a
```

Out[63]= 65.7534

In[64]:=
```
σxz2 = N[Nz / IyT * 800] / 4 / a
```

Out[64]= 16.4384

In[65]:=
```
σxz3 = N[Nz / IyT * 900] / 4 / a
```

Out[65]= 18.4932

In[78]:=
```
σxz1 = -N[Nz / IyT * S1] / a;
σxz2 = -N[Nz / IyT * S2] / 4 / a;
p1 = Plot[σxz1, {z, -zT, a - zT}];
p2 = Plot[σxz2, {z, a - zT, 2 a - zT}];
Show[p1, p2, PlotRange → All]
```

Out[82]=

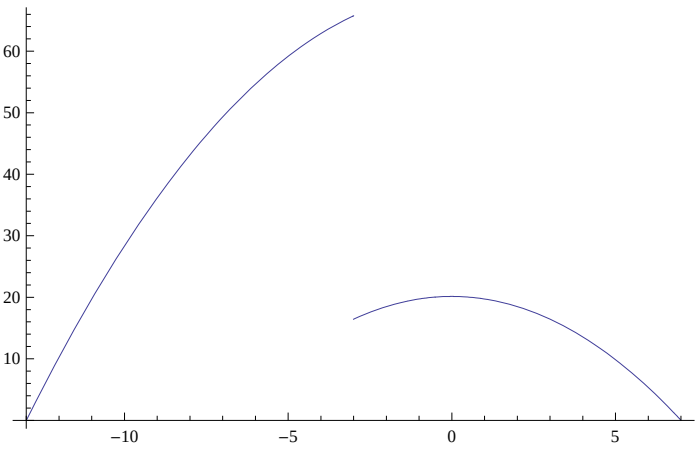


TABELA DOLŽIN, KOSINUSOV IN OSNIH TOGOSTI ZA PODANO PALIČJE

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

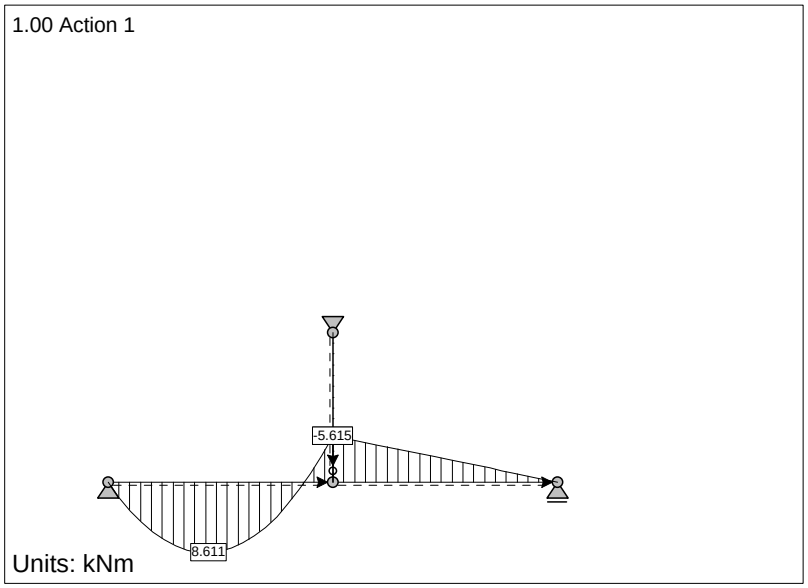
POMIKI IN REAKCIJE VOZLIŠČ DANEGA PALIČJA

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		

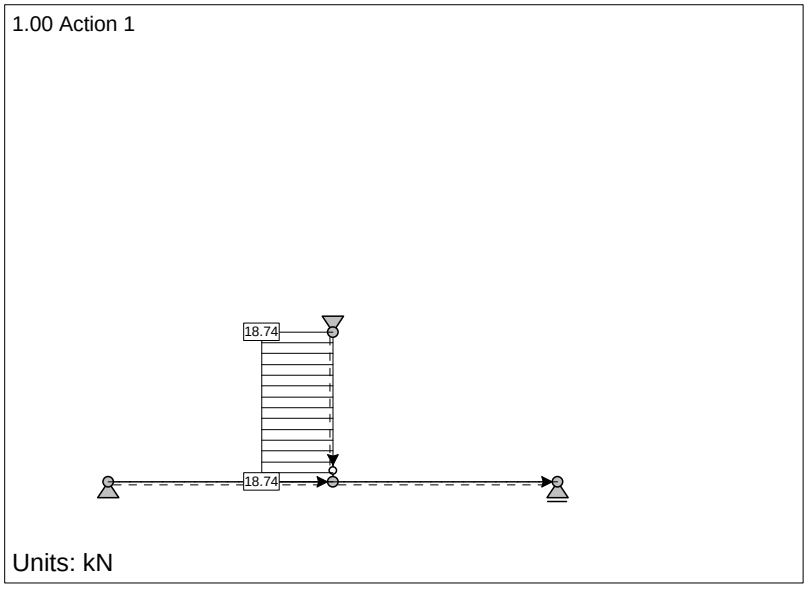
TABELA OSNIH SIL ZA PODANO PALIČJE

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

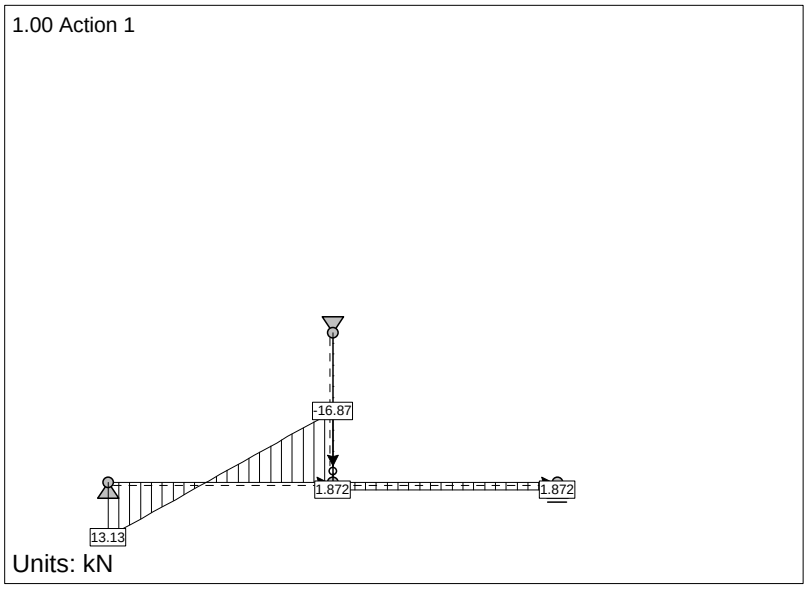
LC1: Load case 2: Bending Moments My



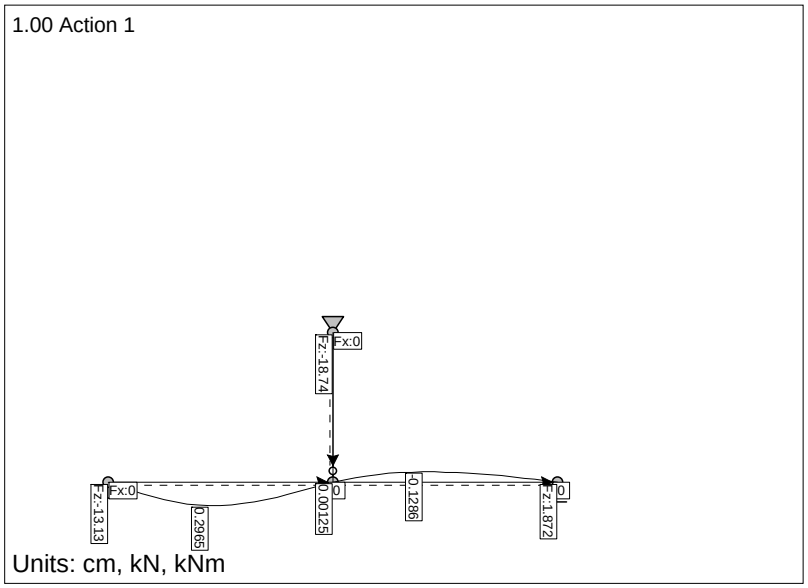
LC1: Load case 2: Axial Forces Fx



LC1: Load case 2: Shear Forces Fz



LC1: Load case 2: Displacements and Reactions



LC1: Load case 2: Rotations