ГРАЂЕВИНСКИ ФАКУЛТЕТ УНИВЕРЗИТЕТА У БЕОГРАДУ

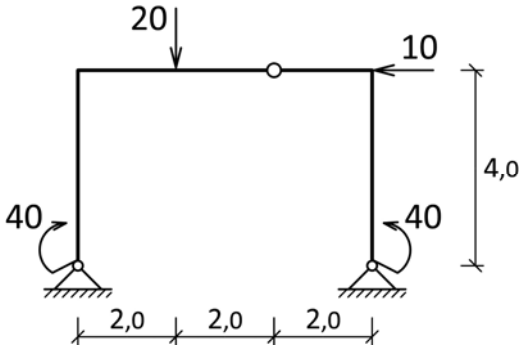
Усмени (теоријски) део испита из **ТЕХНИЧКЕ МЕХАНИКЕ 1**

(писмени део одржан 28.06.2018.)

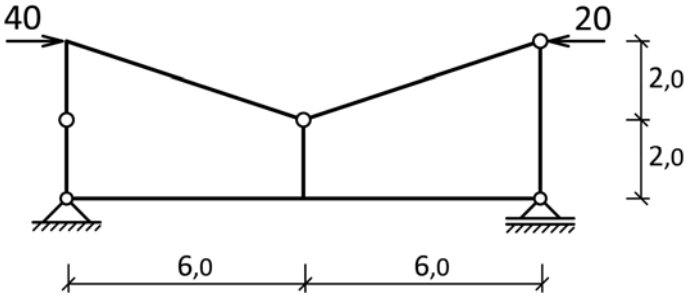
1. ЗАДАТАК (условни 50 %)

Нацртати дијаграме сила у пресеку за приказане носаче.

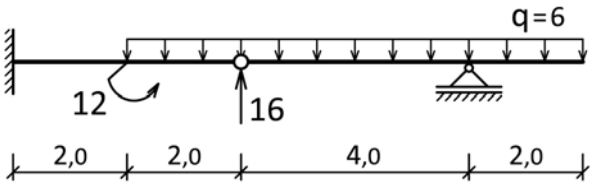
а)



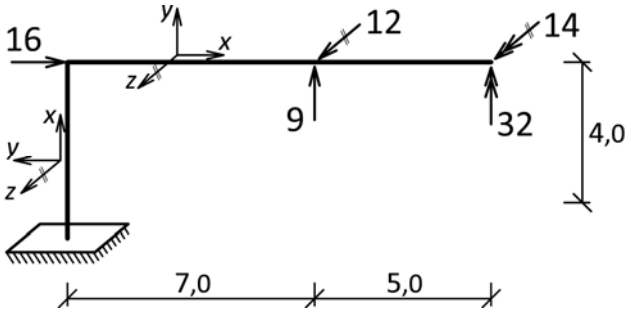
б)



в)



г)



2. ЗАДАТАК (28 %)

а) Приказати и укратко објаснити Aronhold-Kennedy-еву теорему.

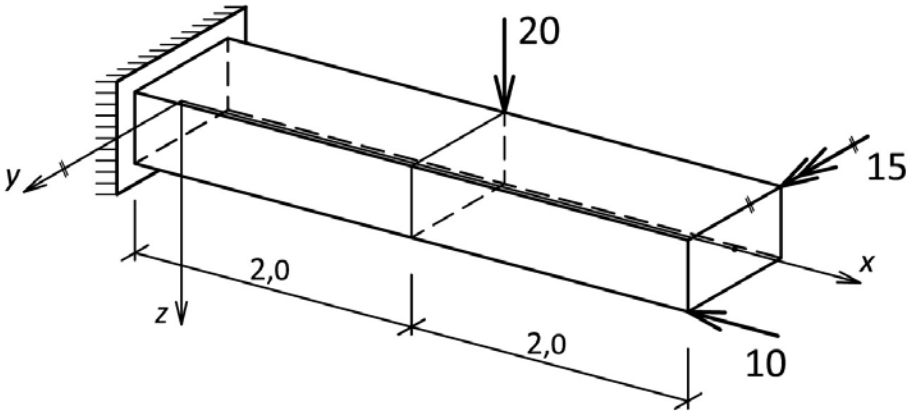
б) Применом опште једначине статике одредити:

* хоризонталну реакцију веза у „десном“ непокретном ослонцу (задатак 1а),
* силу у „десном“ вертикалном простом штапу (задатак 1б),
* моменат у укљештењу (задатак 1в).

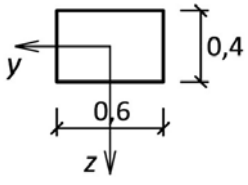
3. ЗАДАТАК (22 %)

а) Дефинисати моменат силе за осу и навести два става у вези са појмом момента силе за осу.

б) Извршити редукцију свог задатог оптерећења на осу посматраног конзолног штапа.



попречни пресек штапа



Напомена: У свим задацима димензије за дужине и силе су: *m, N*

ГРАЂЕВИНСКИ ФАКУЛТЕТ УНИВЕРЗИТЕТА У БЕОГРАДУ

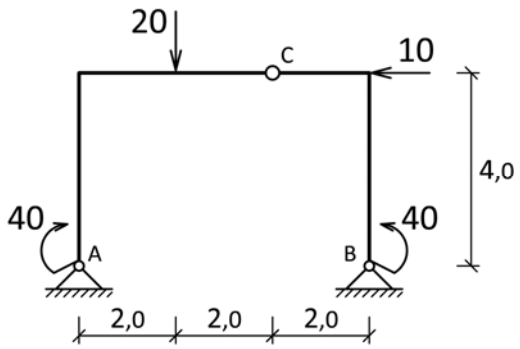
Усмени (теоријски) део испита из **ТЕХНИЧКЕ МЕХАНИКЕ 1**

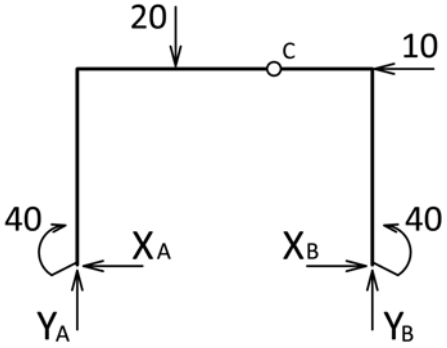
(писмени део одржан 28.06.2018.)

- Р Е Ш Е Њ А -

1. ЗАДАТАК (условни 50 %)

а)



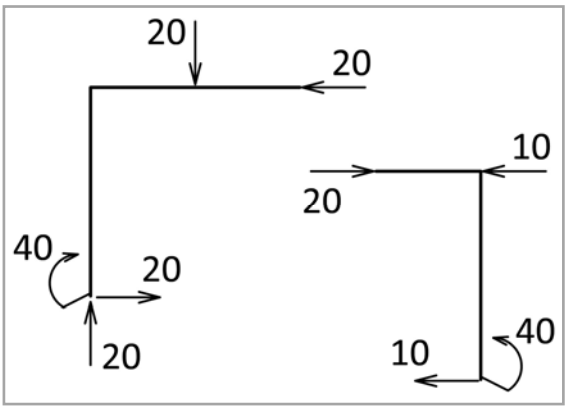


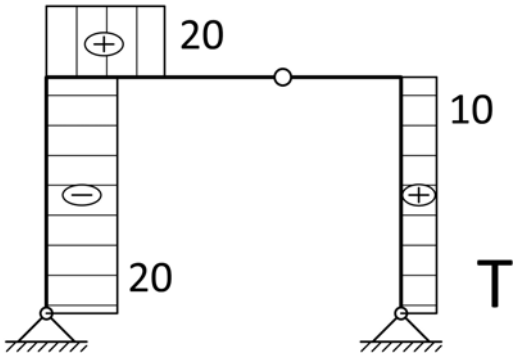
$\sum M_A = 0 : Y_B \cdot 6 + 10 \cdot 4 - 20 \cdot 2 + 30 - 40 = 0 \rightarrow \underline{Y_B = 0}$

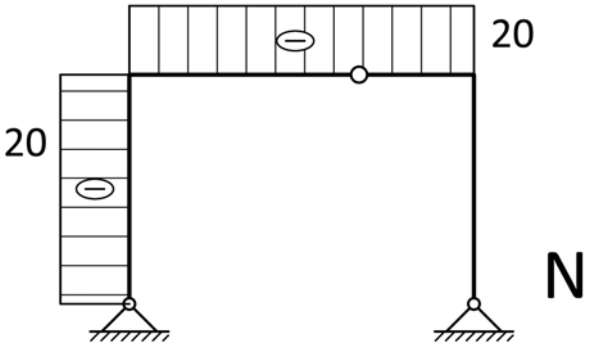
$\sum F_Y = 0 : Y_A + Y_B - 20 = 0 \rightarrow \underline{Y_A = 20}$

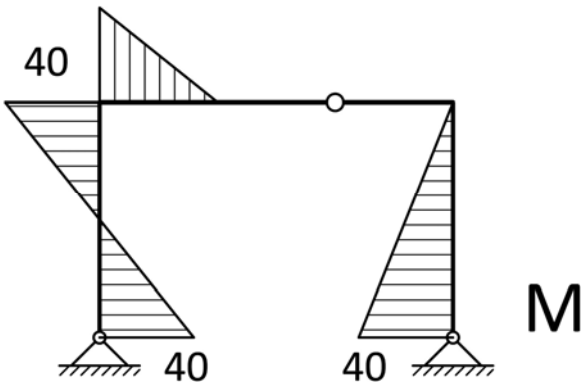
$\sum M_{C,дес} = 0 : X_B \cdot 4 + Y_B \cdot 2 + 40 = 0 \rightarrow \underline{X_B = -10}$

$\sum F_X = 0 : -X_A + X_B - 10 = 0 \rightarrow \underline{X_A = -20}$









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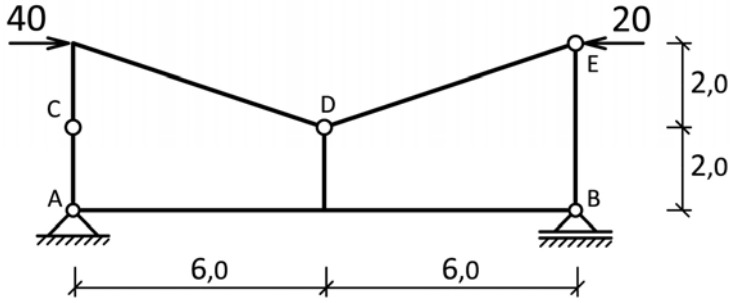
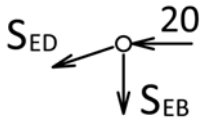


$\sum F_X = 0: \; -X_D + 40 = 0 \rightarrow \underline{X_D = 40}$

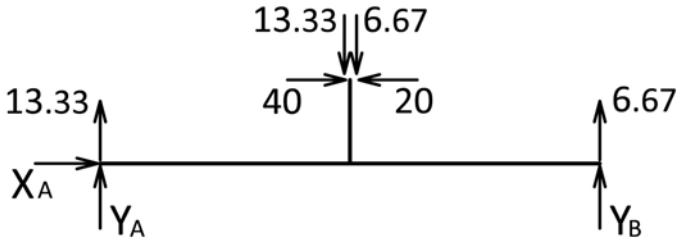
$\sum M_D = 0: \; S_{AC} \cdot 6 - 40 \cdot 2 = 0 \rightarrow \underline{S_{AB} = 13.33}$

$\sum F_Y = 0: \; Y_D - S_{AC} = 0 \rightarrow \underline{Y_D = 13.33}$



$\sum F_X = 0: \; -0.949 \cdot S_{ED} - 20 = 0 \rightarrow \underline{S_{ED} = -21.08}$

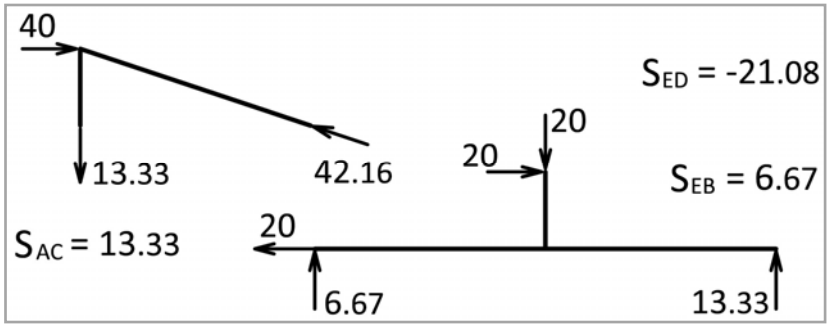
$\sum F_Y = 0: \; -0.316 \cdot S_{ED} - S_{EB} = 0 \rightarrow \underline{S_{EB} = 6.67}$

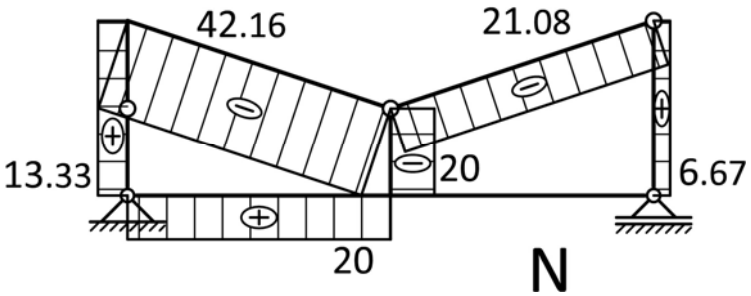


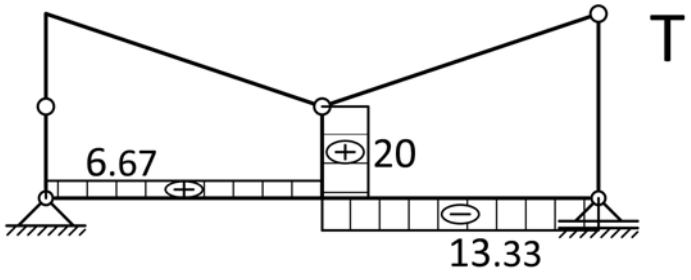
$\sum F_X = 0: \; X_A + 40 - 20 = 0 \rightarrow \underline{X_A = -20}$

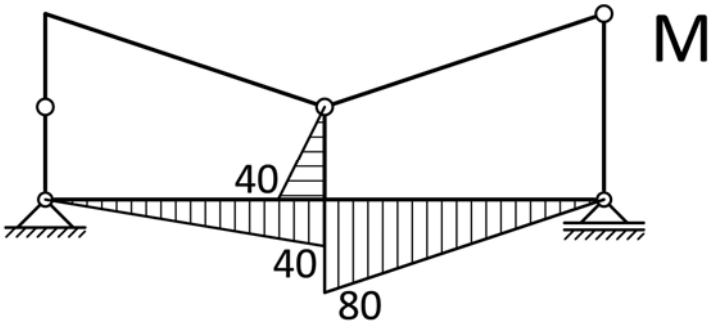
$\sum M_A = 0: Y_B \cdot 12 + 6.67 \cdot 12 - 20 \cdot 6 - 20 \cdot 2 = 0$
$\rightarrow \underline{Y_B = 6.67}$

$\sum F_Y = 0: Y_A + Y_B + 13.33 + 6.67 - 20 = 0$
$\rightarrow \underline{Y_A = -6.67}$

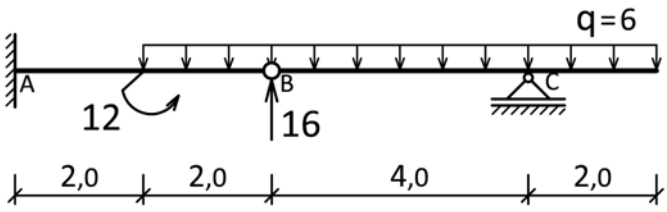


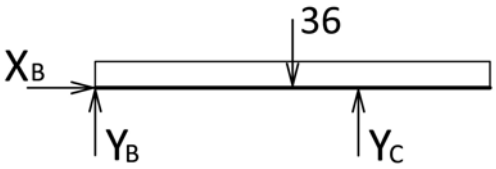






в)

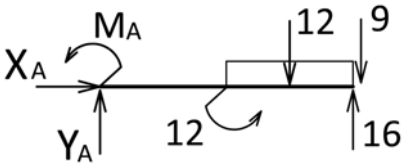




$\sum F_X = 0: \rightarrow \underline{X_B = 0}$

$\sum M_B = 0: Y_C \cdot 4 - 36 \cdot 3 = 0 \rightarrow \underline{Y_C = 27}$

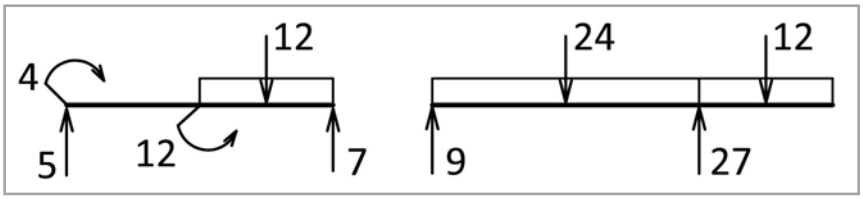
$\sum F_Y = 0: Y_B + Y_C - 36 = 0 \rightarrow \underline{Y_B = 9}$

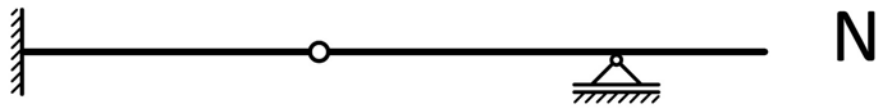


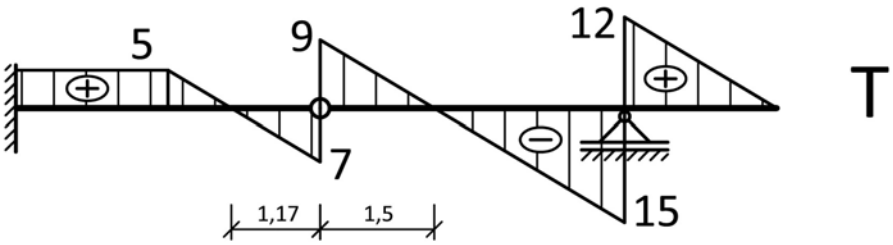
$\sum F_X = 0: \rightarrow \underline{X_A = 0}$

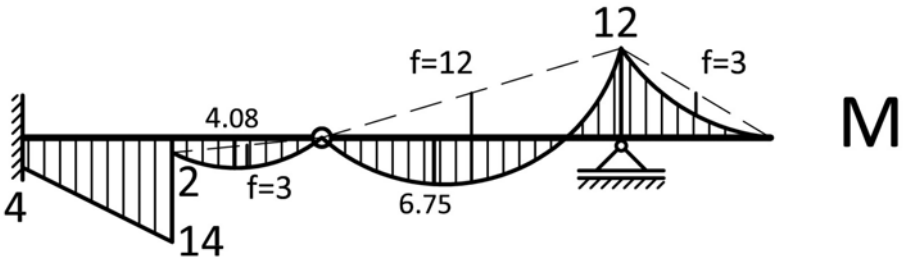
$\sum F_Y = 0: Y_A - 12 + 16 - 9 = 0 \rightarrow \underline{Y_A = 5}$

$\sum M_A = 0: M_A + (16-9) \cdot 4 - 12 \cdot 3 + 12 = 0 \rightarrow \underline{M_A = -4}$

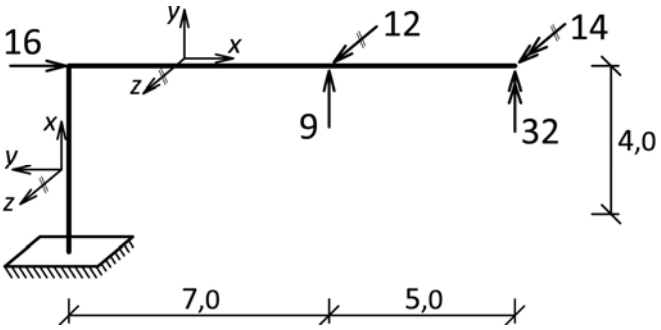


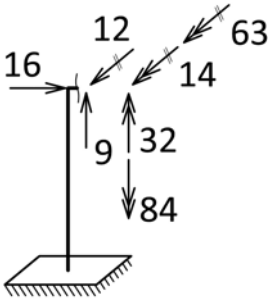


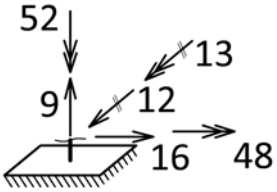




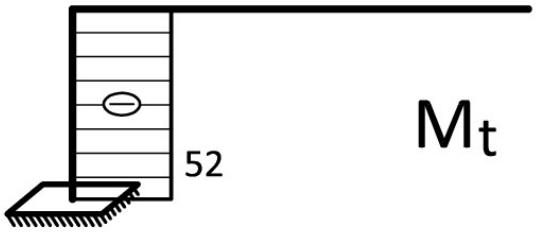
г)

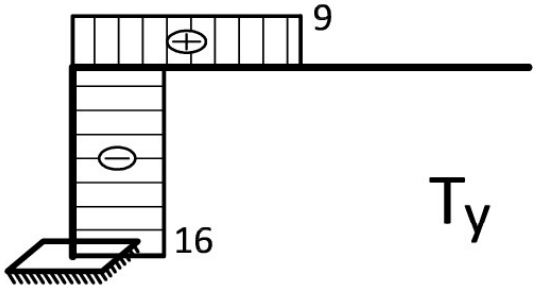

y
x
z
16
12
14
9
32
4,0
x
y
z
7,0
5,0

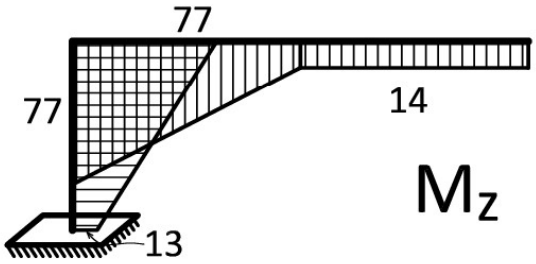

12
63
16
14
9
32
84


52
13
9
12
16
48


9
N


52
Mt


9
16
Ty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77
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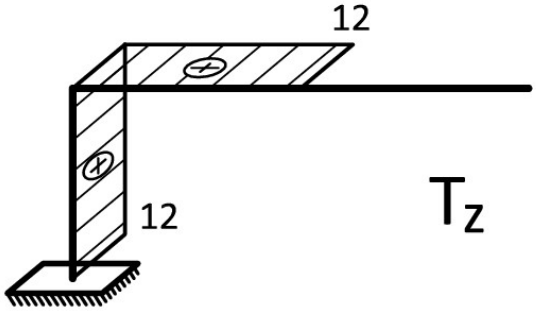
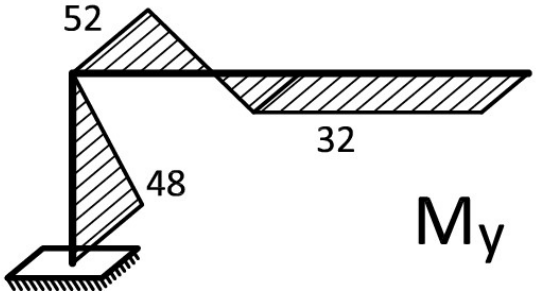
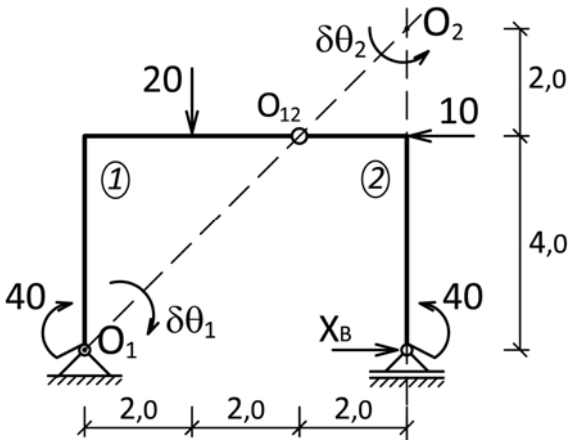
13
Mz


12
12
Tz


52
32
48
My

2. ZADATAK (28 %)

б) X_B =? (zad. 1a)

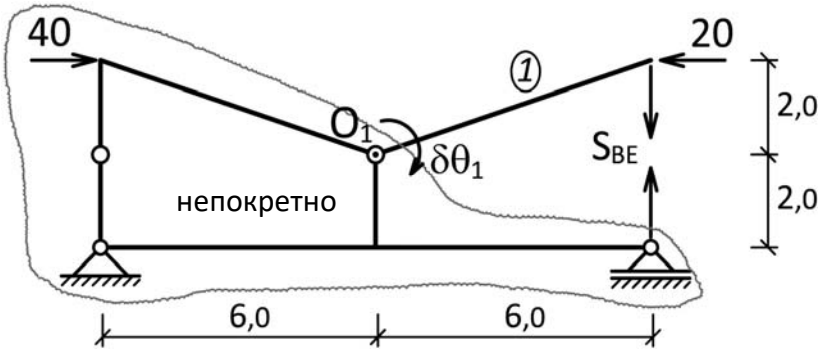


$\delta r_{O12,y} = \delta\theta_1 \cdot 4 = \delta\theta_2 \cdot 2 \rightarrow \delta\theta_1 = 0.5 \cdot \delta\theta_2$

$\delta A = X_B \cdot (6 \cdot \delta\theta_2) - 10 \cdot (2 \cdot \delta\theta_2) +$
$+ 20 \cdot (2 \cdot \delta\theta_1) + 40 \cdot \delta\theta_1 + 40 \cdot \delta\theta_2 = 0$

$6 \cdot X_B \cdot \delta\theta_2 + 60 \cdot \delta\theta_2 = 0 \rightarrow \underline{X_B = -10.0}$

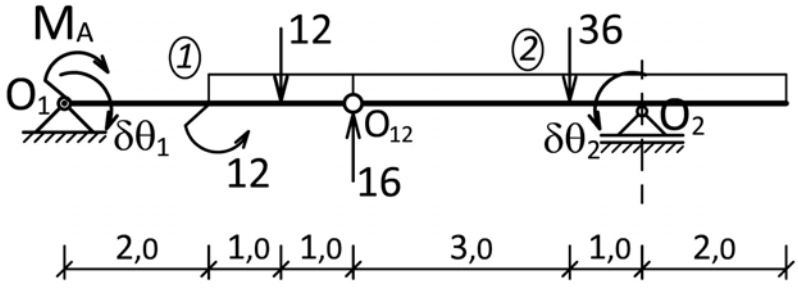
S_{BE} =? (zad. 1b)



$\delta A = S_{BE} \cdot (6 \cdot \delta\theta_1) - 20 \cdot (2 \cdot \delta\theta_1) = 0$

$\rightarrow \underline{S_{BE} = 6.67}$

M_A =? (zad. 1v)



$\delta r_{O12,y} = \delta\theta_1 \cdot 4 = \delta\theta_2 \cdot 4$

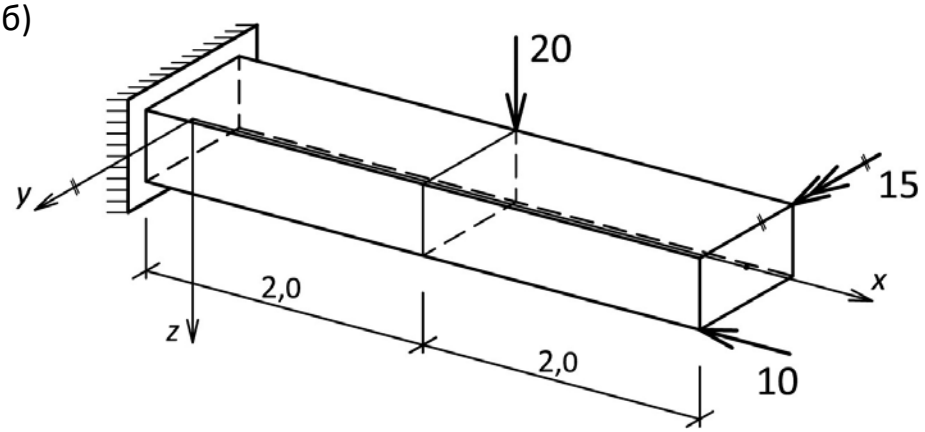
$\rightarrow \delta\theta_1 = \delta\theta_2$

$\delta A = M_A \cdot \delta\theta_1 - 12 \cdot \delta\theta_1 + 12 \cdot (3 \cdot \delta\theta_1) - 16 \cdot (4 \cdot \delta\theta_1) + 36 \cdot (1 \cdot \delta\theta_1) = 0$

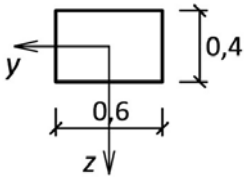
$M_A \cdot \delta\theta_1 - 4 \cdot \delta\theta_1 = 0 \rightarrow \underline{M_A = 4}$

3. ЗАДАТАК (22 %)

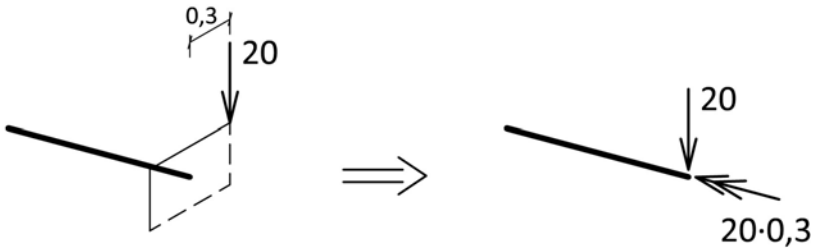
б)



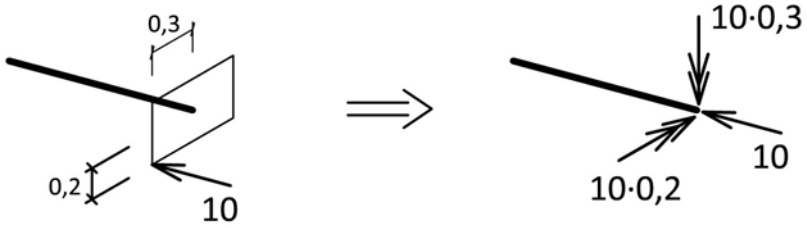
попречни пресек штапа



- редукција силе $F_z = 20$ на осу штапа



- редукција силе $F_x = 10$ на осу штапа



<u>Силе редуковане на осу штапа</u>