ГРАЂЕВИНСКИ ФАКУЛТЕТ УНИВЕРЗИТЕТА У БЕОГРАДУ

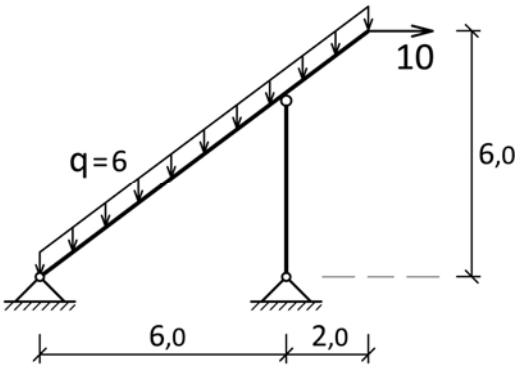
Усмени (теоријски) део испита из **ТЕХНИЧКЕ МЕХАНИКЕ 1**

(писмени део одржан 09.09.2018.)

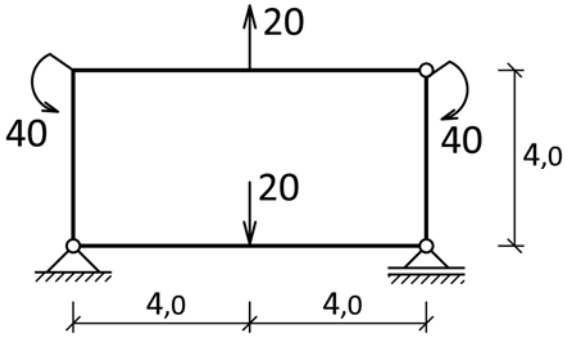
1. ЗАДАТАК (условни 50 %)

Нацртати дијаграме сила у пресеку за приказане носаче.

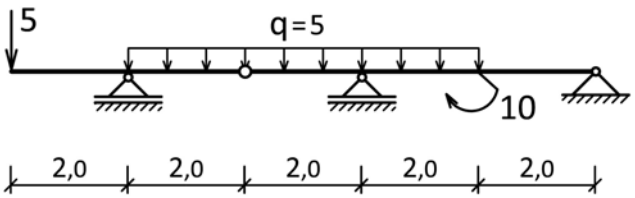
а)



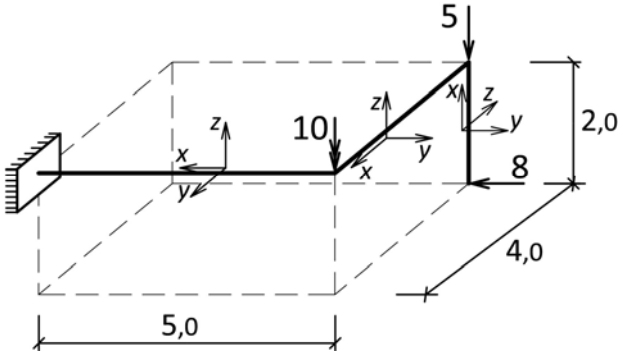
б)



в)



г)



2. ЗАДАТАК (32 %)

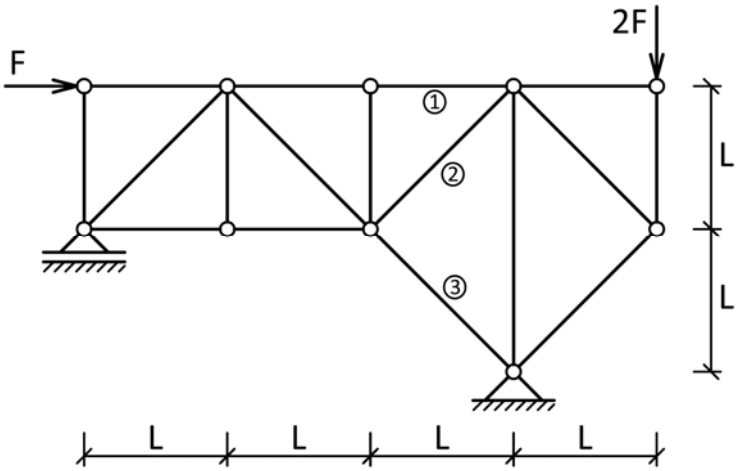
а) Приказати и објаснити Општу једначину статике. Написати у Декартовим координатама израз за виртуелни рад силе која делује на слободно круто тело.

б) За приказани решеткасти носач одредити:

* Силе у штаповима 1, 2 и 3 Ритеровим поступком.

* Силе у штаповима 1 и 3 применом Опште једначине статике.

Напомена: Обавезно нагласити да ли штапови затегнути или притиснути.



3. ЗАДАТАК (18 %)

а) Приказати поступак трансформације спрега у равни.

б) Приказати поступак трансформације спрега у простору.

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

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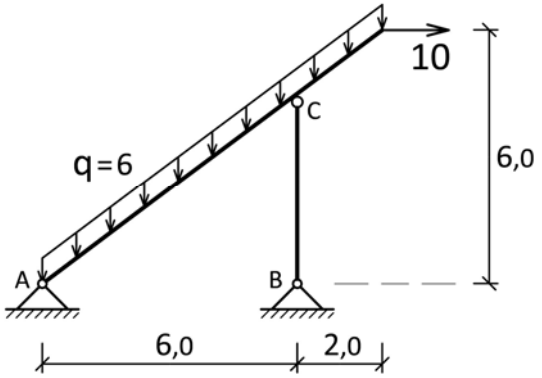
Усмени (теоријски) део испита из **ТЕХНИЧКЕ МЕХАНИКЕ 1**

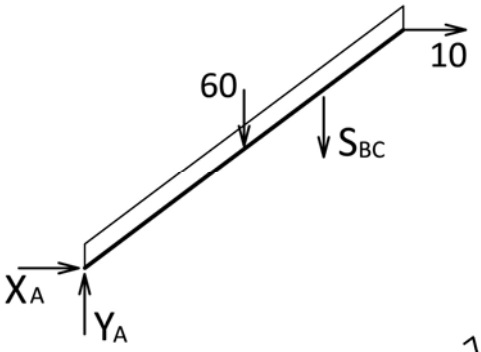
(писмени део одржан 09.09.2018.)

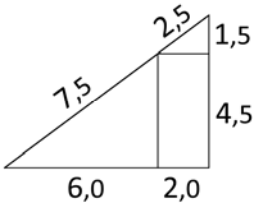
- Р Е Ш Е Њ А -

1. ЗАДАТАК (условни 50 %)

а)



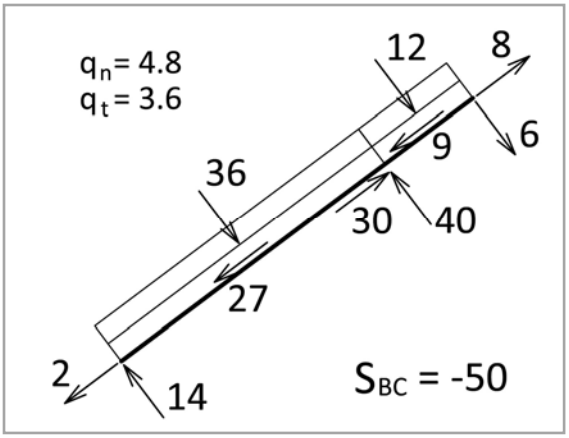


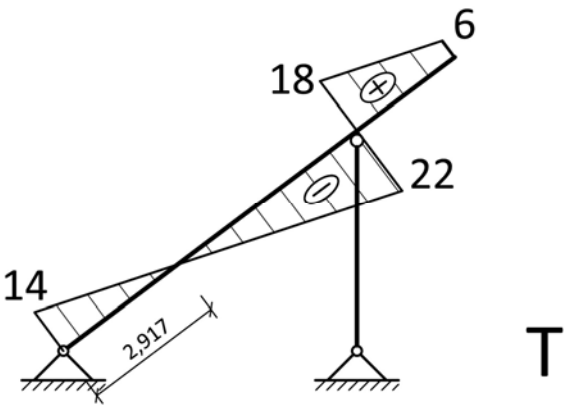


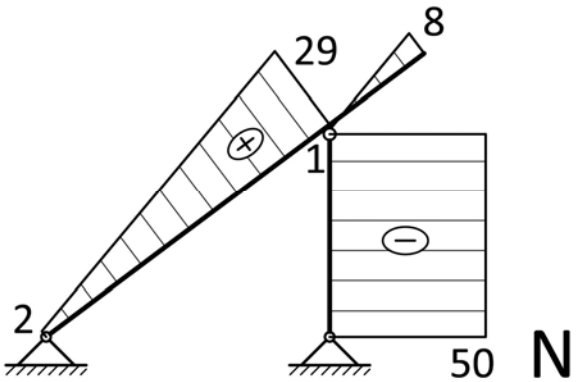
$\sum F_X = 0 : \; X_A + 10 = 0 \rightarrow \underline{X_A = -10}$

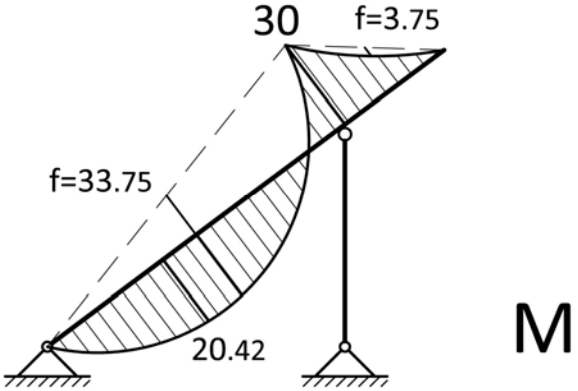
$\sum M_A = 0 : S_{BC} \cdot 6 + 60 \cdot 4 + 10 \cdot 6 = 0 \rightarrow \underline{Y_B = -50}$

$\sum F_Y = 0 : \; Y_A - S_{BC} - 60 = 0 \rightarrow \underline{Y_A = 10}$

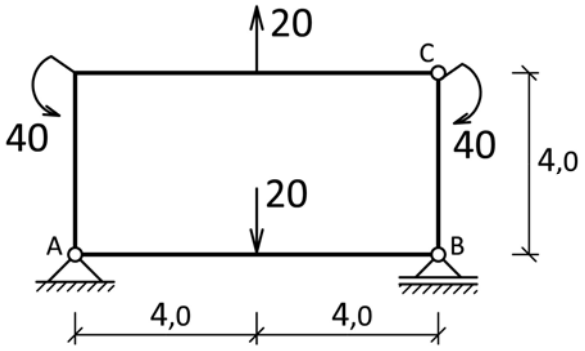


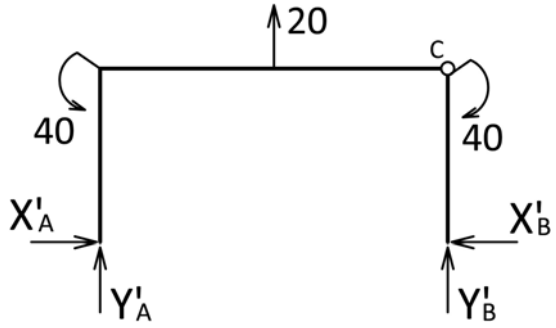






б)



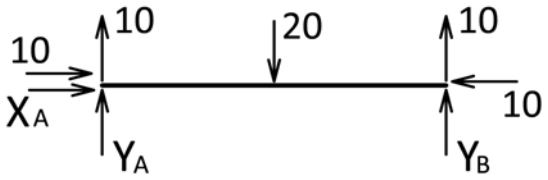


$\sum M_A = 0 : Y'_B \cdot 8 + 20 \cdot 4 - 40 + 40 = 0 \rightarrow \underline{Y'_B = -10}$

$\sum F_Y = 0 : Y'_A + Y'_B + 20 = 0 \rightarrow \underline{Y'_A = -10}$

$\sum M_{C,дол} = 0 : X'_B \cdot 4 + 40 = 0 \rightarrow \underline{X'_B = -10}$

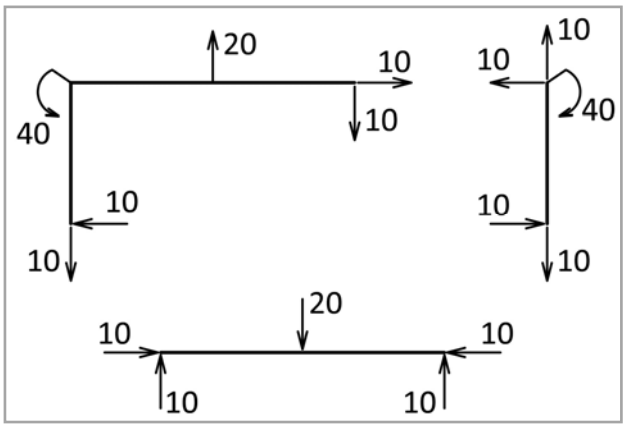
$\sum F_X = 0 : \; X'_A - X'_B = 0 \rightarrow \underline{X'_A = -10}$

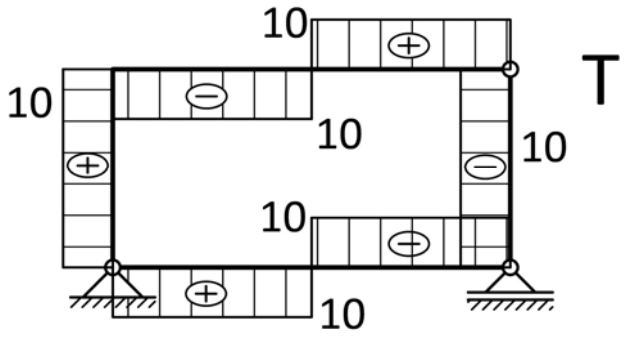


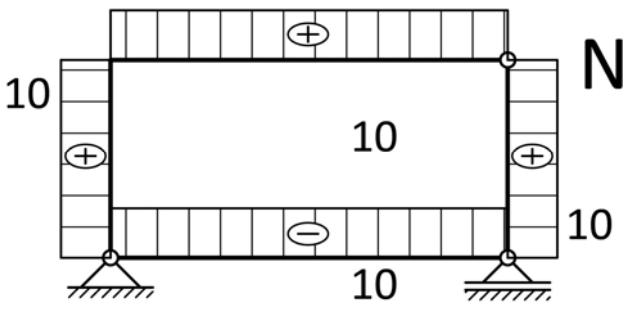
$\sum F_X = 0 : \; X_A + 10 - 10 = 0 \rightarrow \underline{X_A = 0}$

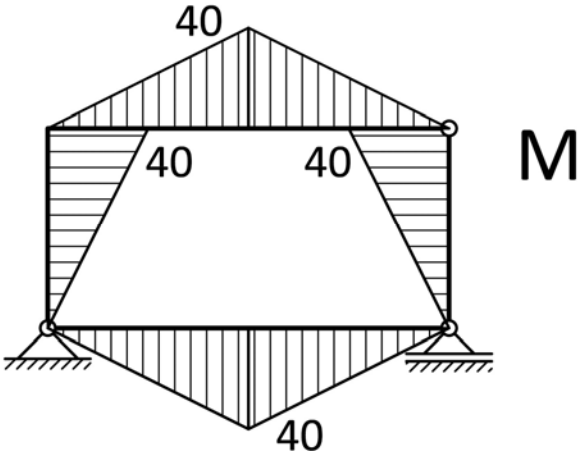
$\sum M_A = 0 : Y_B \cdot 8 + 10 \cdot 8 - 20 \cdot 4 = 0 \rightarrow \underline{Y_B = 0}$

$\sum F_Y = 0 : Y_A + Y_B + 10 - 20 + 10 = 0 \rightarrow \underline{Y_A = 0}$









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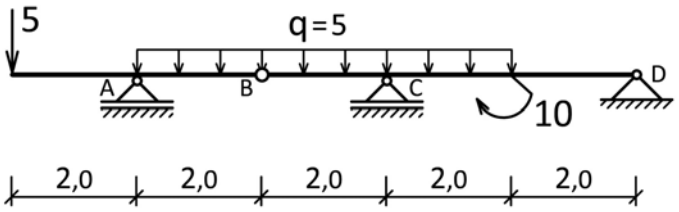
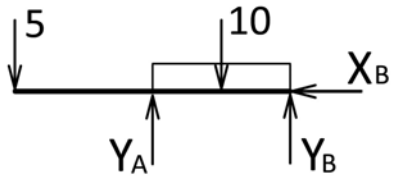
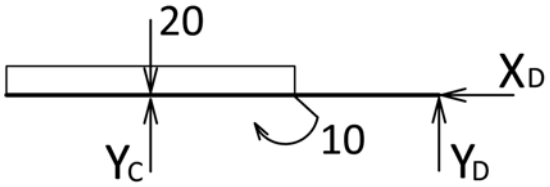




$\sum F_X = 0 : \rightarrow \underline{X_B = 0}$

$\sum M_B = 0 : Y_A \cdot 2 - 10 \cdot 1 - 5 \cdot 4 = 0 \rightarrow \underline{Y_A = 15}$

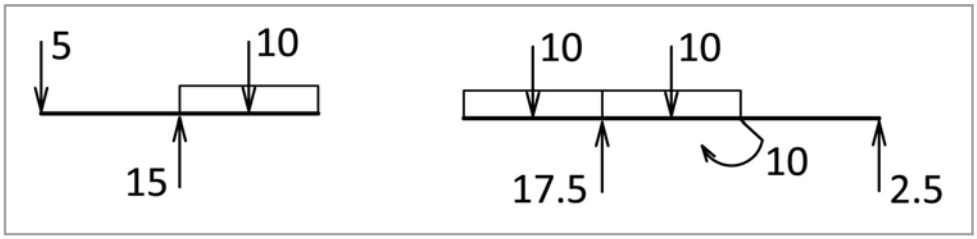
$\sum F_Y = 0 : Y_A + Y_B - 10 - 5 = 0 \rightarrow \underline{Y_A = 0}$

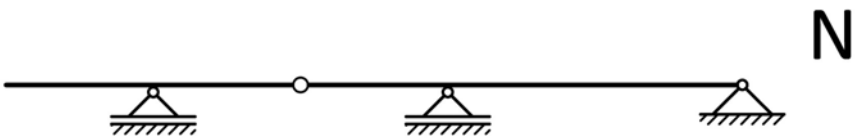


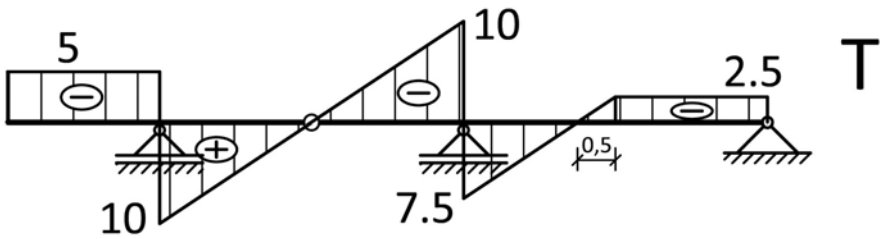
$\sum F_X = 0 : \rightarrow \underline{X_D = 0}$

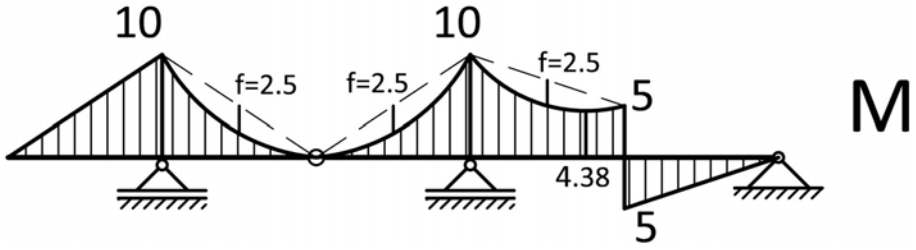
$\sum M_D = 0 : Y_C \cdot 4 - 20 \cdot 4 + 10 = 0 \rightarrow \underline{Y_C = 17.5}$

$\sum F_Y = 0 : Y_D + Y_C - 20 = 0 \rightarrow \underline{Y_D = 2.5}$

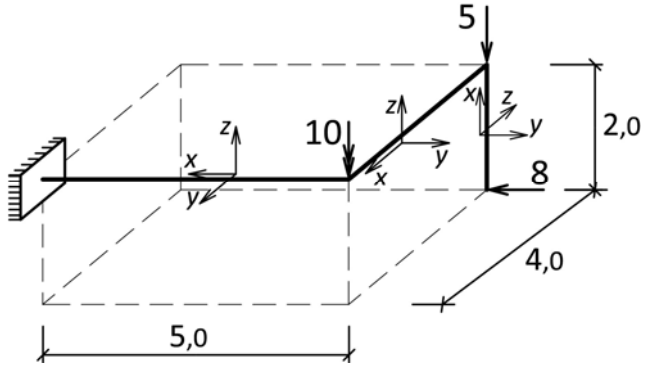








г)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4,0
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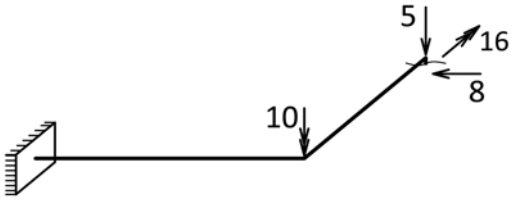
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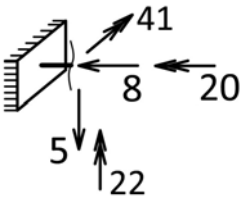
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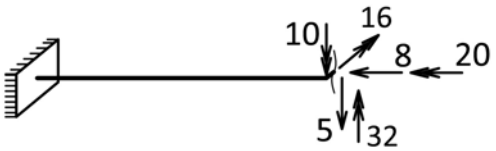
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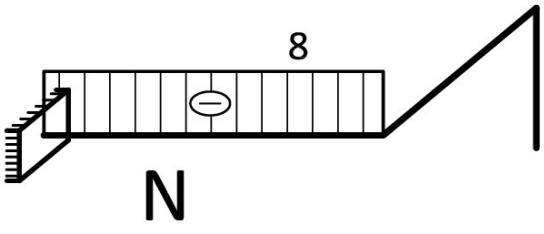
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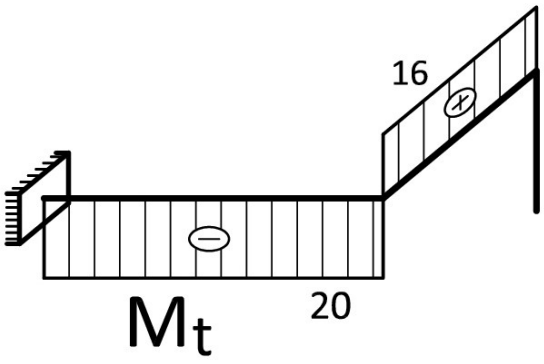
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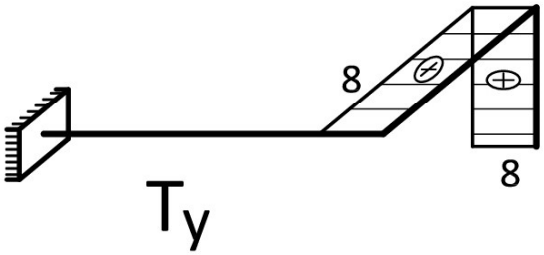
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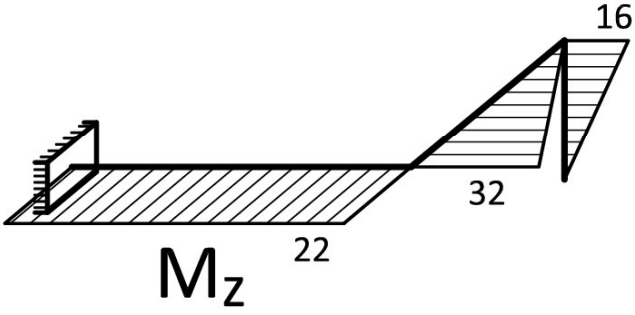
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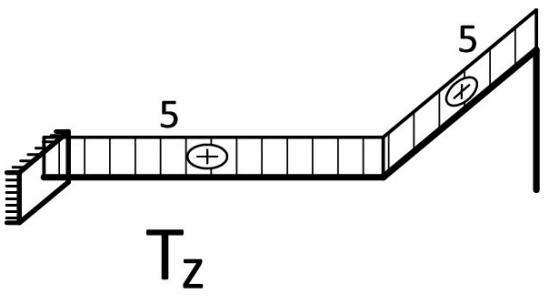
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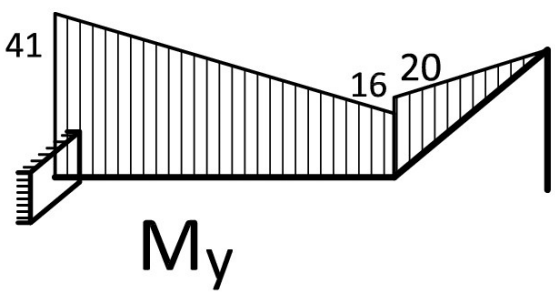
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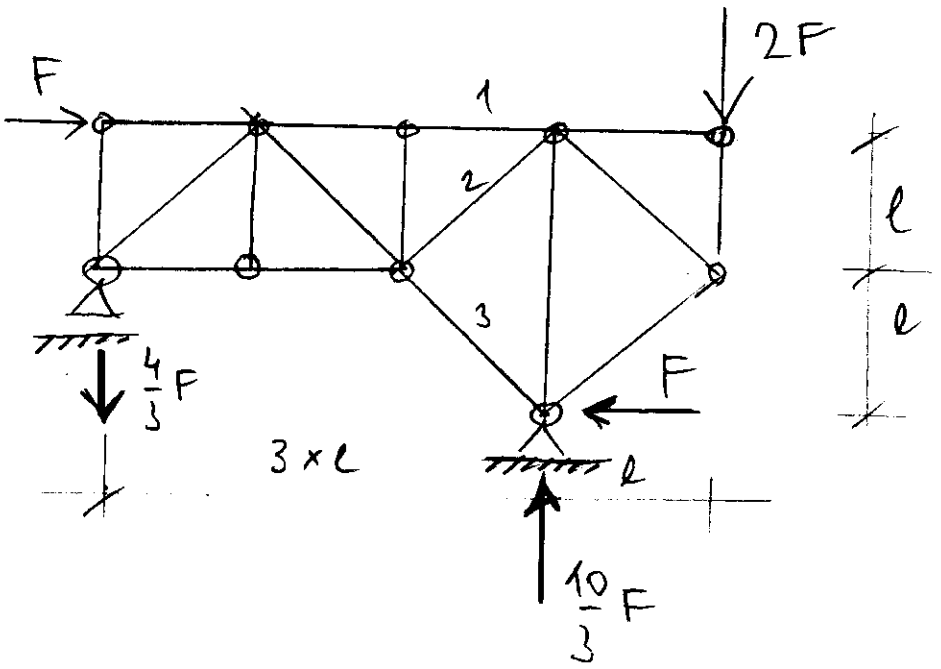
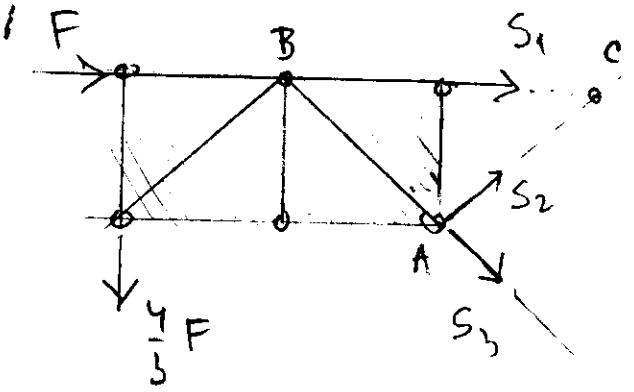
2. ЗАДАТАК



Ритеров поступак



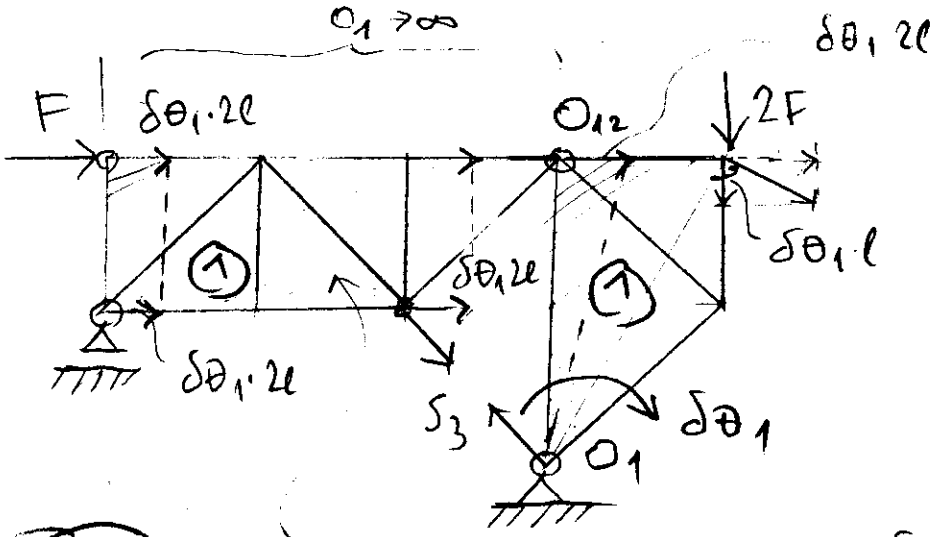
A, B, C Ритерове тачке за S_1, S_2 и S_3

$\sum M_A = 0 \quad S_1 \cdot l + F \cdot l - \frac{4}{3} F \cdot 2l = 0 \quad S_1 = \frac{5}{3} F$ (затезање)

$\sum M_B = 0 \quad S_2 \, l\sqrt{2} - \frac{4}{3} F \cdot l = 0 \quad S_2 = -\frac{2}{3}\sqrt{2} F$ (притисак)

$\sum M_C = 0 \quad S_3 \, l + \frac{4}{3} F \cdot 3l = 0 \quad S_3 = -2\sqrt{2} F$ (притисак)

Примена Опште једначине статике

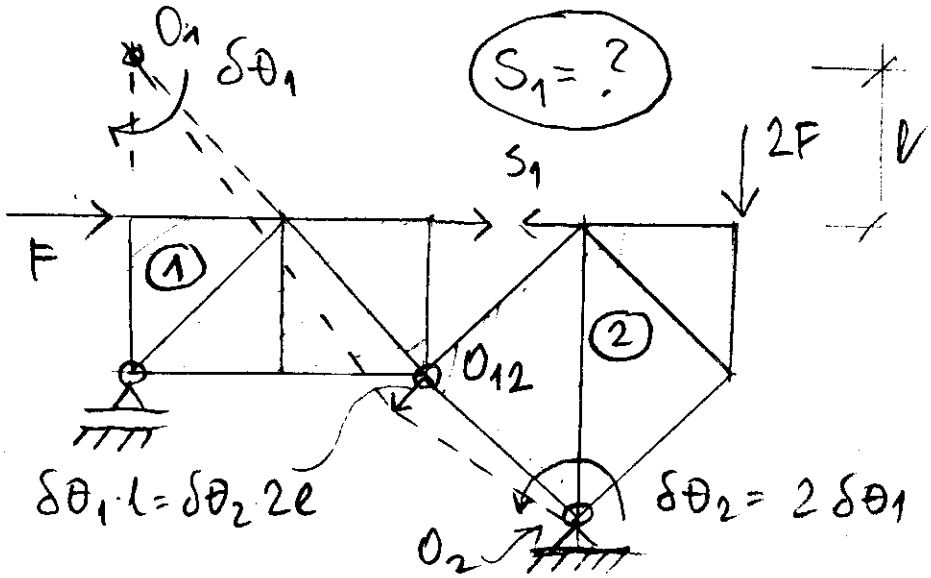


ВИРТУЕЛНА ТРАНСЛАЦИЈА ($\delta\theta_1 = 0$)

$S_3 = ?$

$$\delta A = 2F \cdot \ell \cdot \delta\theta_1 + F \cdot 2\ell\,\delta\theta_1 + \frac{S_3}{\sqrt{2}} 2\ell\,\delta\theta_1 = 0$$

$$\boxed{S_3 = -2\sqrt{2}F}$$



$$\delta A = -F\ell\,\delta\theta_1 - 2F \cdot \ell\,\delta\theta_2 - S_1\ell\,\delta\theta_1 + S_1 2\ell\,\delta\theta_2 = 0$$

$$\delta A = -5F\ell\,\delta\theta_1 + 3S_1\ell\,\delta\theta_1 = 0$$

$$\boxed{S_1 = \frac{5}{3}F}$$