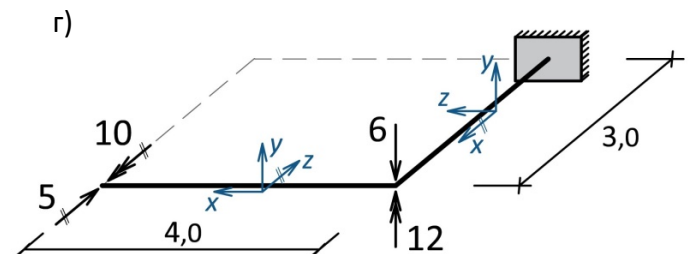
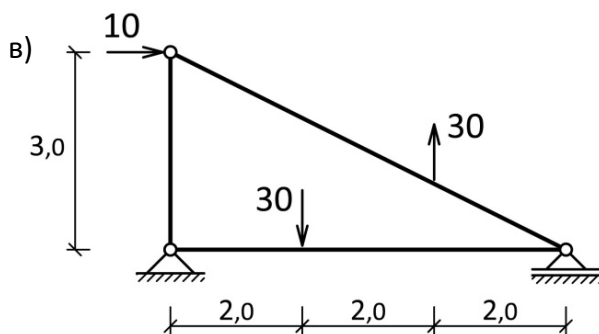
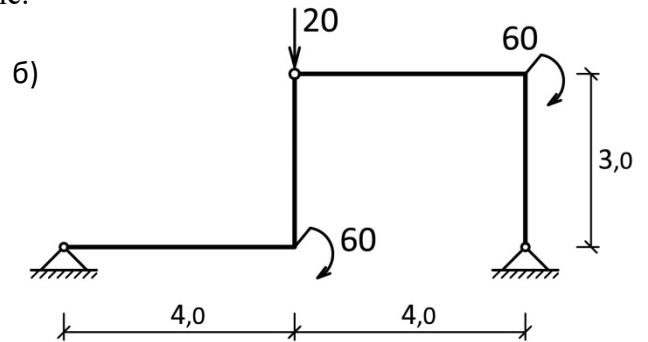
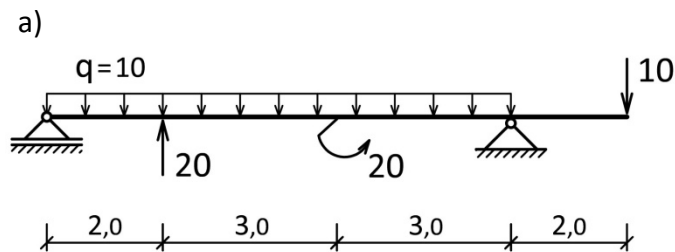


**ГРАЂЕВИНСКИ ФАКУЛТЕТ УНИВЕРЗИТЕТА У БЕОГРАДУ**  
 Други (теоријски) део испита из **ТЕХНИЧКЕ МЕХАНИКЕ 1**  
 (писмени део одржан 26.01.2024.)

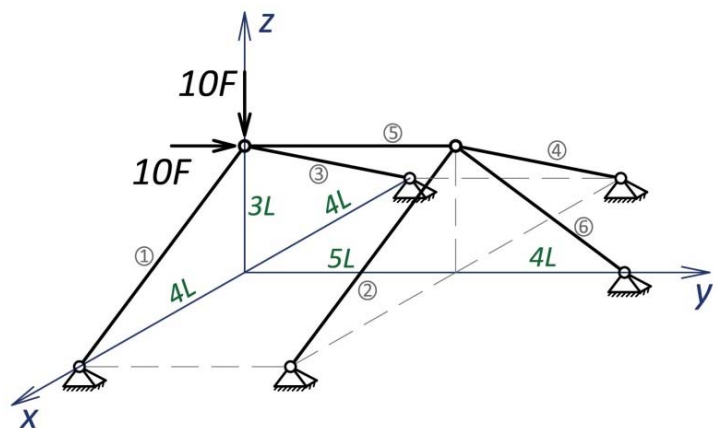
**1. ЗАДАТАК** (условни 50 %)

Нацртати дијаграме сила у пресеку за приказане носаче.



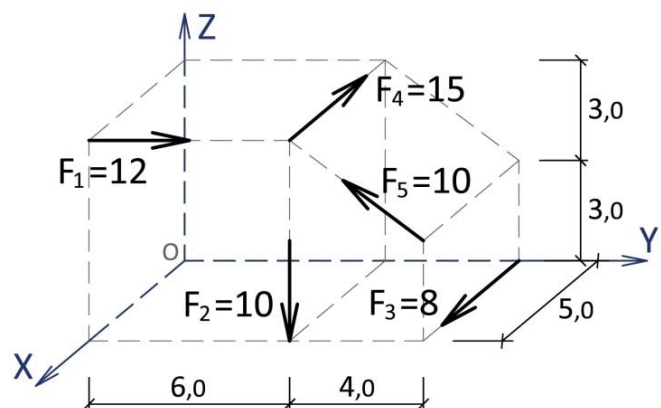
**2. ЗАДАТАК** (18 %)

Одреди силе у штаповима приказаног просторног носача.



**3. ЗАДАТАК** (32 %)

- Приказати резиме о редукцији произвољног система сила у простору.
- Испитати на шта се своди приказани систем сила редукцијом на координатни почетак. У случају резултанте наћи нападну линију резултанте, а у случају динаме наћи једначину централне осе.

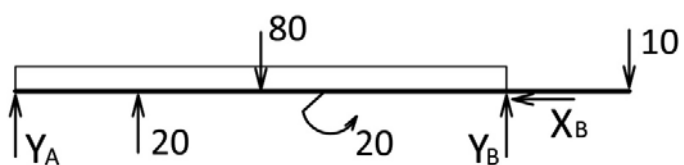
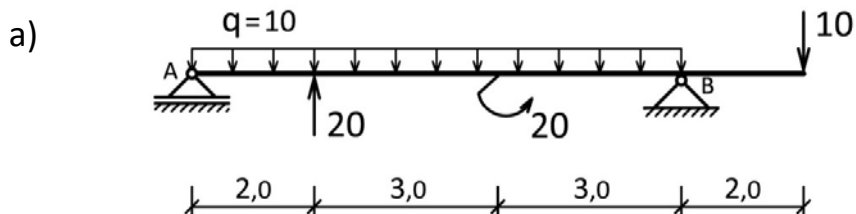


Напомена: У свим задацима димензије за дужине и силе су:  $m, kN$

**ГРАЂЕВИНСКИ ФАКУЛТЕТ УНИВЕРЗИТЕТА У БЕОГРАДУ**  
 Други (теоријски) део испита из **ТЕХНИЧКЕ МЕХАНИКЕ 1**  
 (писмени део одржан 26.01.2024.)

**- Р Е Ш Е Њ А -**

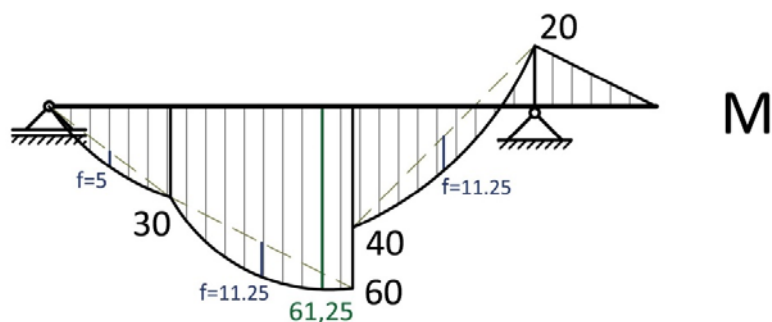
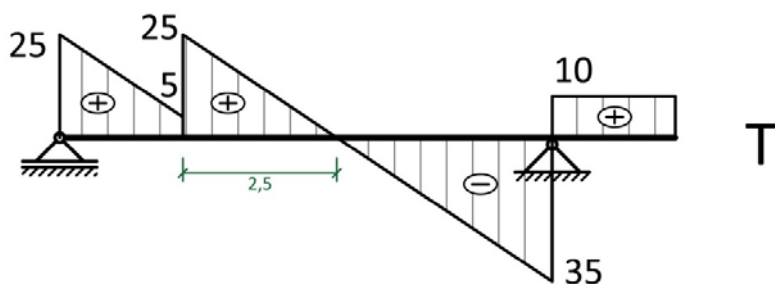
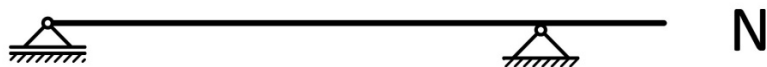
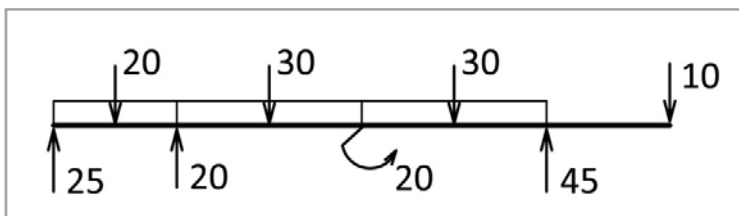
**1. ЗАДАТАК** (условни 50 %)



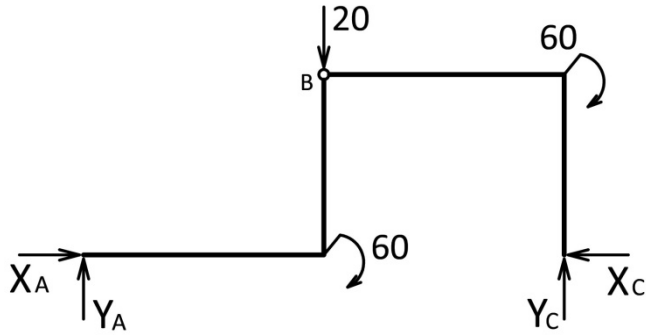
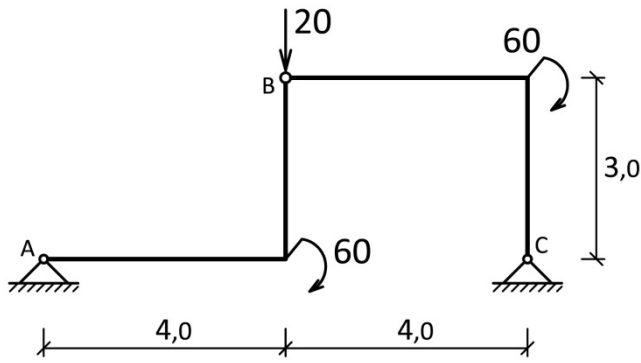
$$\sum F_x = 0 : X_B = 0$$

$$\sum M_A = 0 : Y_B \cdot 8 + 20 \cdot 2 - 80 \cdot 4 + 20 - 10 \cdot 10 = 0 \rightarrow Y_B = 45$$

$$\sum F_y = 0 : Y_A + Y_B + 20 - 80 - 10 = 0 \rightarrow Y_A = 25$$



6)

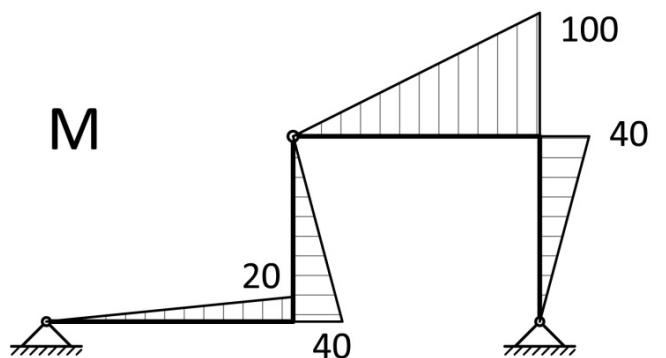
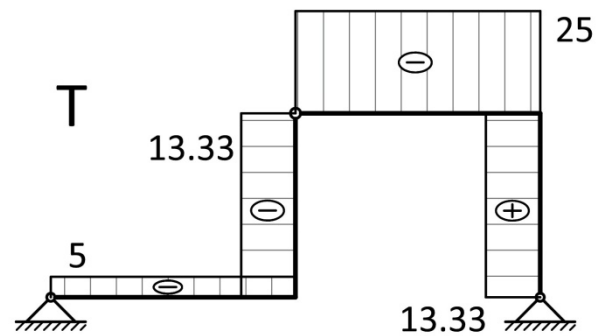
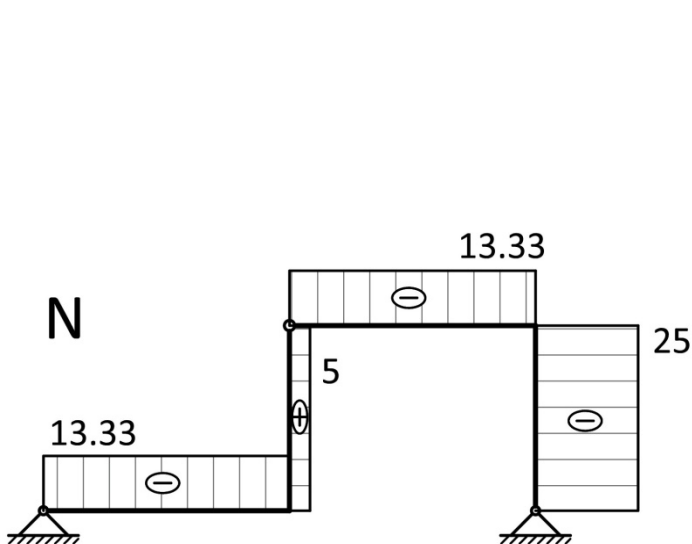
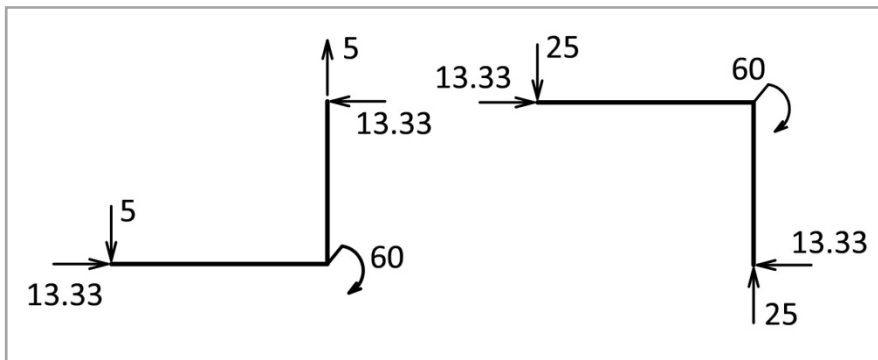


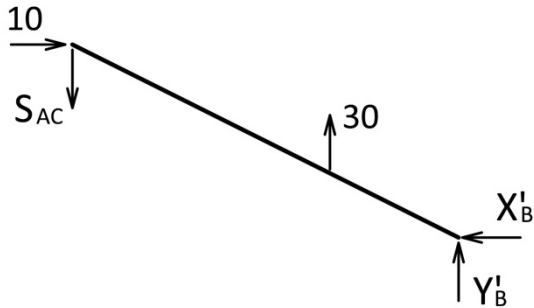
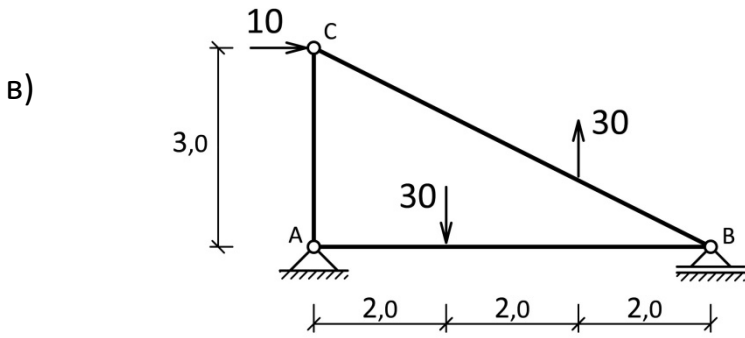
$$\sum M_A = 0 : Y_C \cdot 8 - 20 \cdot 4 - 60 - 60 = 0 \rightarrow \underline{Y_C = 25}$$

$$\sum F_Y = 0 : Y_A + Y_C - 20 = 0 \rightarrow \underline{Y_A = -5}$$

$$\sum M_{B,dec} = 0 : X_C \cdot 3 - Y_C \cdot 4 + 60 = 0 \rightarrow \underline{X_C = 13.33}$$

$$\sum F_X = 0 : X_A - X_C = 0 \rightarrow \underline{X_A = 13.33}$$

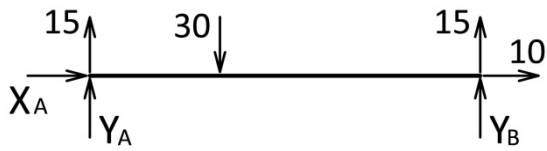




$$\sum M_B = 0 : S_{AC} \cdot 6 - 10 \cdot 3 - 30 \cdot 2 = 0 \rightarrow \underline{S_{AC} = 15}$$

$$\sum F_Y = 0 : Y'_B - S_{AC} + 30 = 0 \rightarrow \underline{Y'_B = -15}$$

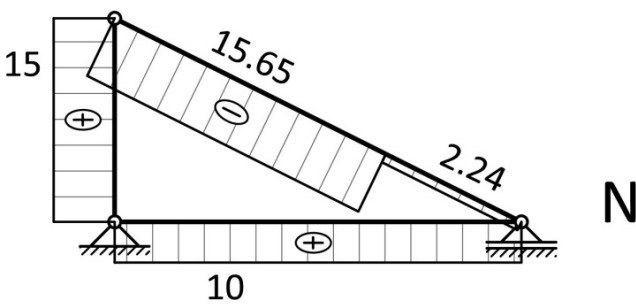
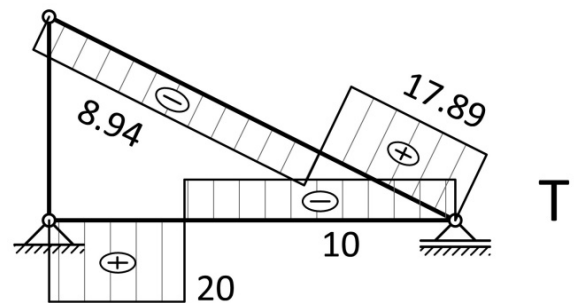
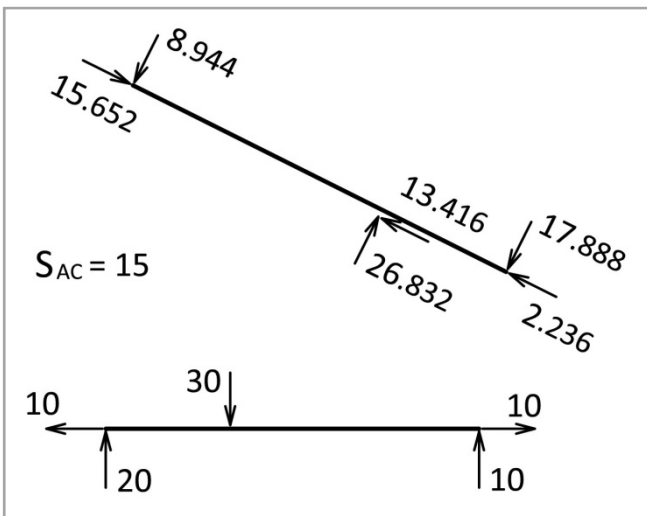
$$\sum F_X = 0 : -X'_B + 10 = 0 \rightarrow \underline{X'_B = 10}$$



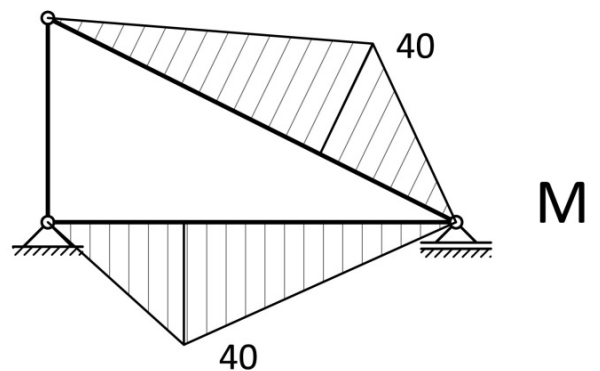
$$\sum F_X = 0 : X_A + 10 = 0 \rightarrow \underline{X_A = -10}$$

$$\sum M_A = 0 : Y_B \cdot 6 + 15 \cdot 6 - 30 \cdot 2 = 0 \rightarrow \underline{Y_B = -5}$$

$$\sum F_Y = 0 : Y_A + Y_B + 15 - 30 + 15 = 0 \rightarrow \underline{Y_A = 5}$$

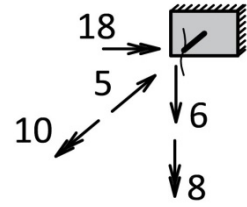
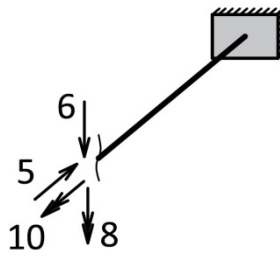
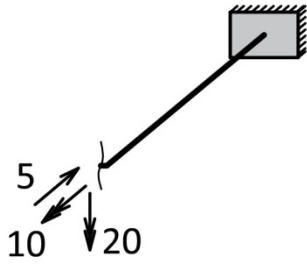
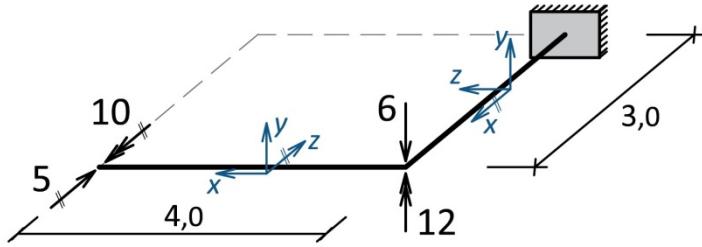


N

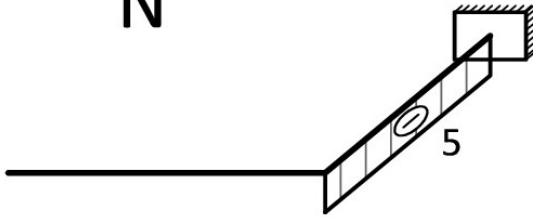


M

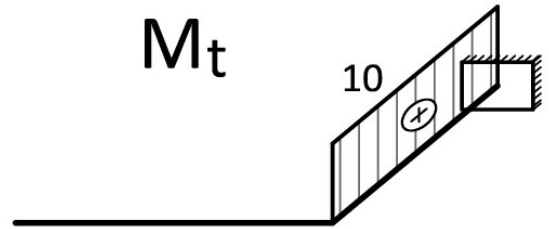
r)



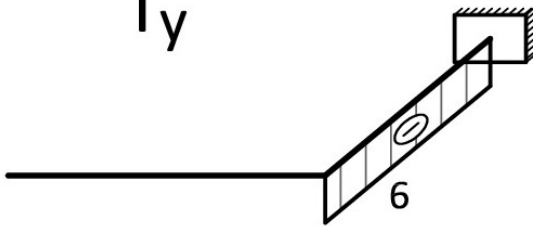
N



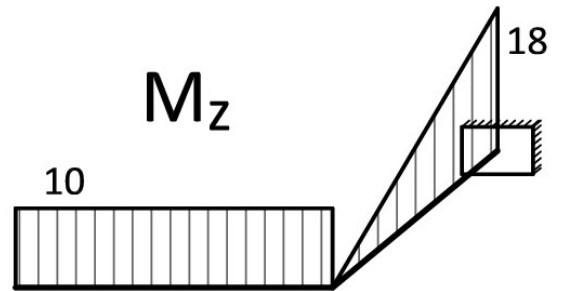
$M_t$



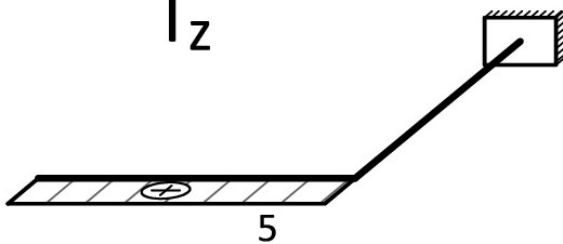
$T_y$



$M_z$



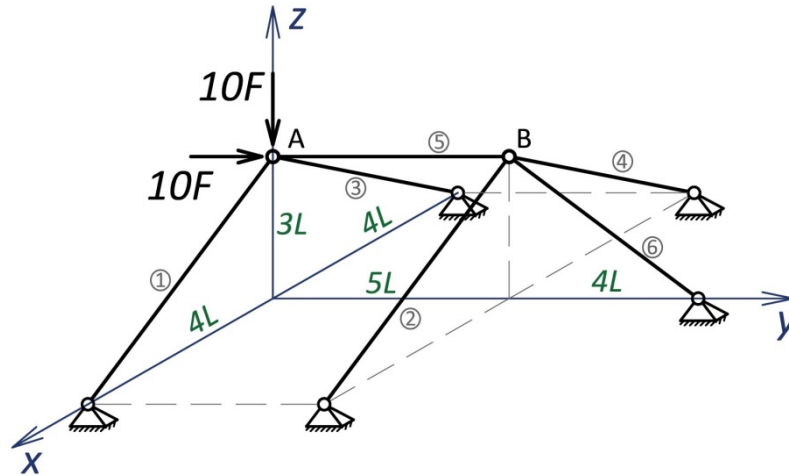
$T_z$



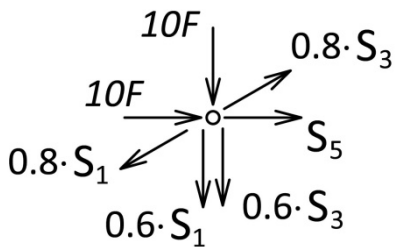
$M_y$



**2. ЗАДАТАК** (18 %)



Равнотежа чвора А:

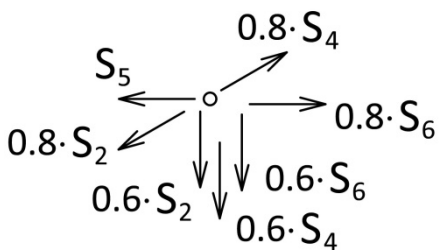


$$\sum F_Y = 0 : 10F + S_5 = 0 \rightarrow \underline{S_5 = -10F}$$

$$\sum F_X = 0 : 0.8 \cdot S_1 - 0.8 \cdot S_3 = 0 \rightarrow \underline{S_1 = -8.33F}$$

$$\sum F_Z = 0 : -0.6 \cdot S_1 - 0.6 \cdot S_3 - 10F = 0 \rightarrow \underline{S_3 = -8.33F}$$

Равнотежа чвора В:



$$\sum F_Y = 0 : -(-10F) + 0.8 \cdot S_6 = 0 \rightarrow \underline{S_6 = -12.5F}$$

$$\sum F_X = 0 : 0.8 \cdot S_2 - 0.8 \cdot S_4 = 0$$

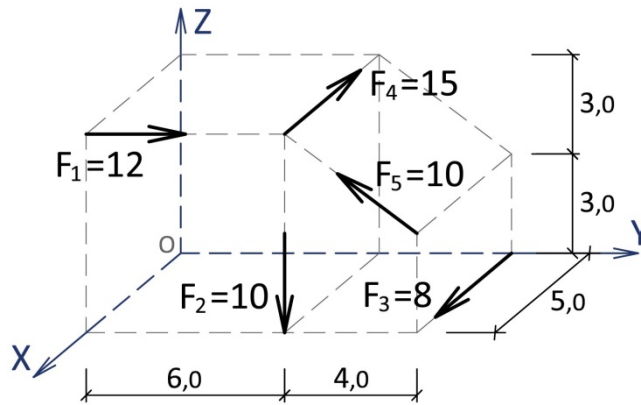
$$\sum F_Z = 0 : -0.6 \cdot S_2 - 0.6 \cdot S_4 - 0.6 \cdot (-12.5F) = 0$$

$$\rightarrow \underline{S_2 = 6.25F}$$

$$\underline{S_4 = 6.25F}$$

### 3. ЗАДАТАК (32 %)

б)



$$\vec{F}_1 = \{0, 12, 0\}$$

$$\vec{M}_1 = \{-72, 0, 60\}$$

$$\vec{F}_2 = \{0, 0, -10\}$$

$$\vec{M}_2 = \{-60, 50, 0\}$$

$$\vec{F}_3 = \{8, 0, 0\}$$

$$\vec{M}_3 = \{0, 0, -80\}$$

$$\vec{F}_4 = \{-15, 0, 0\}$$

$$\vec{M}_4 = \{0, -90, 90\}$$

$$\vec{F}_5 = \{0, -8, 6\}$$

$$\vec{M}_5 = \{84, -30, -40\}$$

$$\vec{F}_R = \{-7, 4, -4\}$$

$$\vec{M}_R^{(0)} = \{-48, -70, 30\}$$

$$M_0 = \frac{\vec{M}_R^{(0)} \cdot \vec{F}_R}{|\vec{F}_R|} = \frac{(-7) \cdot (-48) + 4 \cdot (-70) + (-4) \cdot 30}{\sqrt{(-7)^2 + 4^2 + (-4)^2}} = \frac{-64}{9} = -7.111$$

$\vec{F}_R \neq 0 \wedge M_0 \neq 0 \Rightarrow$  систем сила се своди на ДИНАМУ

$$\vec{M}_0 = M_0 \frac{\vec{F}_R}{|\vec{F}_R|} = \frac{-7.11}{9} \{-7, 4, -4\} = \{5.53, -3.16, 3.16\}$$

$$\mu_R^{(0)} = \vec{M}_R^{(0)} - \vec{M}_0 = \{-48, -70, 30\} - \{5.53, -3.16, 3.16\} = \{-53.53, -66.84, 26.84\}$$

Једначина централне осе:

$$\frac{x + \frac{\mu_{RY}}{Z_R}}{X_R} = \frac{y - \frac{\mu_{RX}}{Z_R}}{Y_R} = \frac{z}{Z_R} \Rightarrow \frac{x + \frac{-66.84}{-4}}{-7} = \frac{y - \frac{-53.53}{-4}}{4} = \frac{z}{-4}$$

$\Rightarrow$

$$\begin{cases} 4x - 7z + 66.84 = 0 \\ y + z - 13.38 = 0 \end{cases}$$