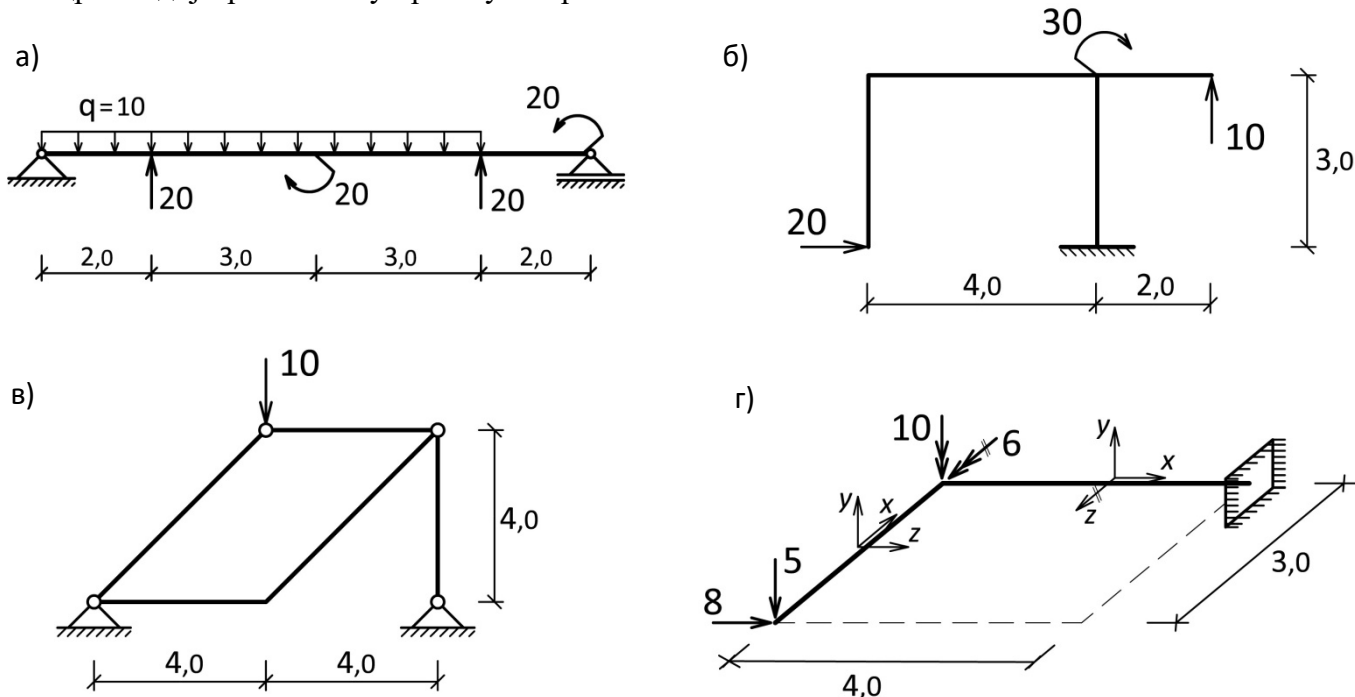


**ГРАЂЕВИНСКИ ФАКУЛТЕТ УНИВЕРЗИТЕТА У БЕОГРАДУ**  
Други (теоријски) део испита из **ТЕХНИЧКЕ МЕХАНИКЕ 1**  
(писмени део одржан 03.07.2021.)

**1. ЗАДАТАК** (условни 50 %)

Нацртати дијаграме сила у пресеку за приказане носаче.

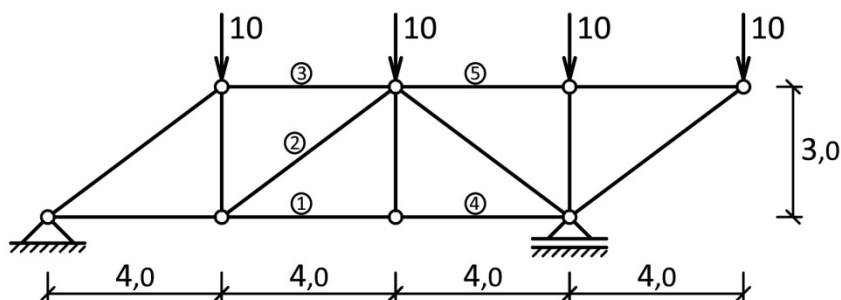


**2. ЗАДАТАК** (30 %)

а) Укратко објаснити Кремонин поступак за одређивање сила у штаповима решеткастог носача.

б) Одредити силе у штаповима 1, 2 и 3 приказаног решеткастог носача применом Ритеровог поступка.

г) Одредити силе у штаповима 4 и 5 приказаног решеткастог носача применом Опште једначине статике.

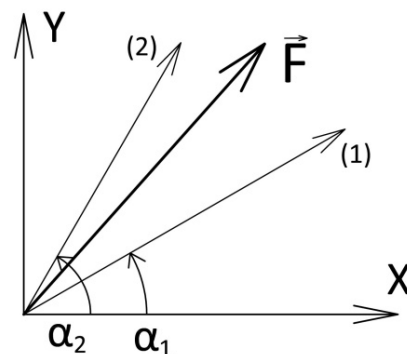


**3. ЗАДАТАК** (20 %)

а) Приказати резиме о редукцији произвољног система сила у простору.

б) Разложити силу  $\vec{F}$  на компоненте у правцима (1) и (2).

$$\vec{F} = \{80, 90\}$$
$$\alpha_1 = 30^\circ$$
$$\alpha_2 = 60^\circ$$

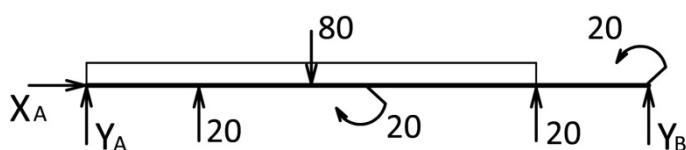
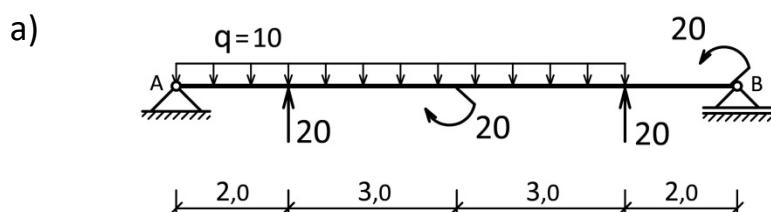


Напомена: У свим задацима димензије за дужине и силе су: m, kN

**ГРАЂЕВИНСКИ ФАКУЛТЕТ УНИВЕРЗИТЕТА У БЕОГРАДУ**  
 Други (теоријски) део испита из **ТЕХНИЧКЕ МЕХАНИКЕ 1**  
 (писмени део одржан 03.07.2021.)

**- Р Е Ш Е Њ А -**

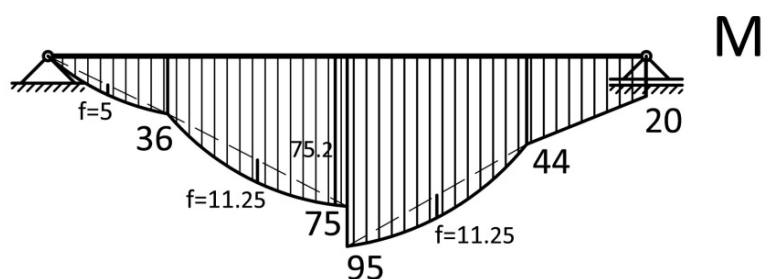
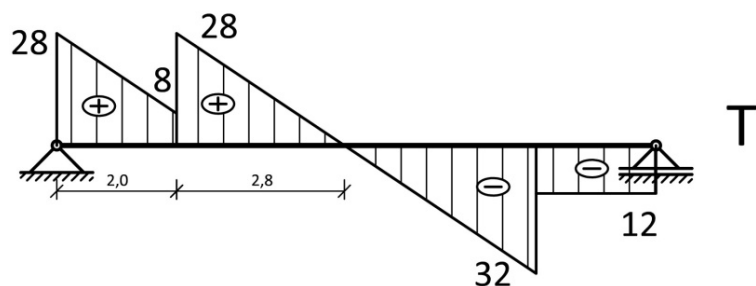
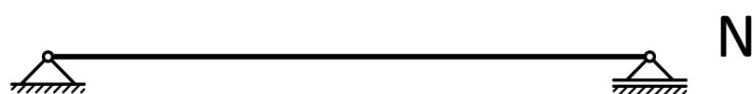
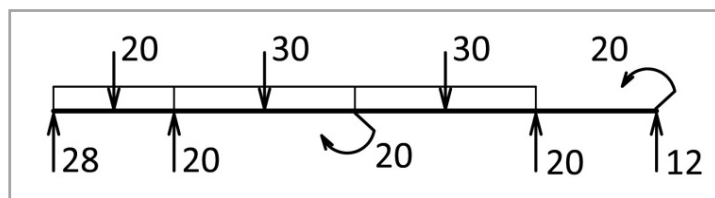
**1. ЗАДАТАК** (условни 50 %)



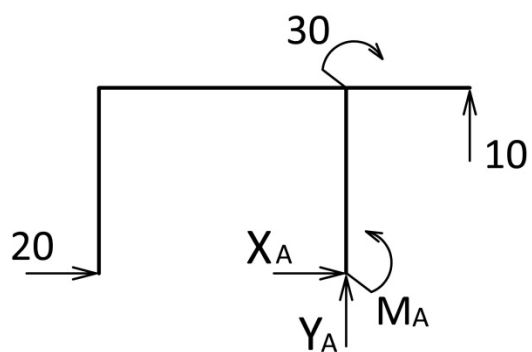
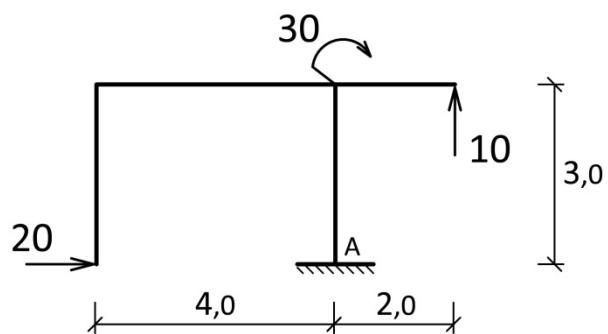
$$\sum F_x = 0 : \rightarrow X_A = 0$$

$$\sum M_A = 0 : Y_B \cdot 10 + 20 + 20 \cdot 8 - 20 - 80 \cdot 4 + 20 \cdot 2 = 0 \rightarrow Y_B = 12$$

$$\sum F_y = 0 : Y_A + Y_B + 20 - 80 + 20 = 0 \rightarrow Y_A = 28$$



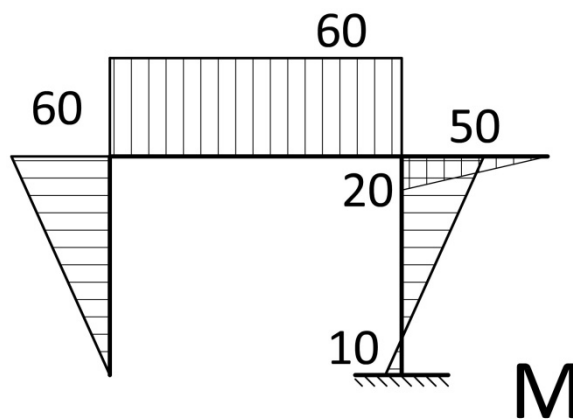
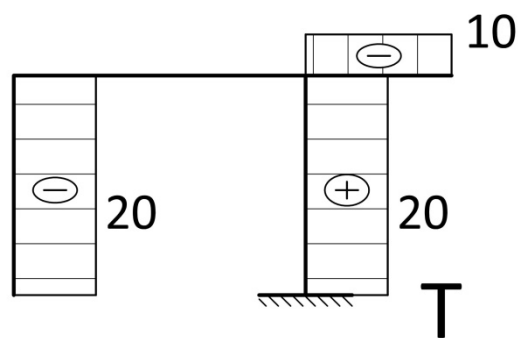
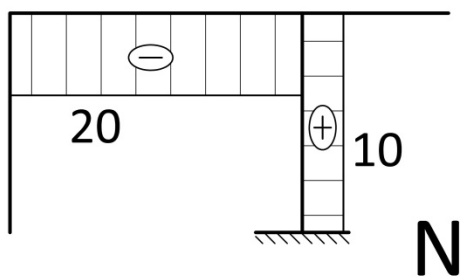
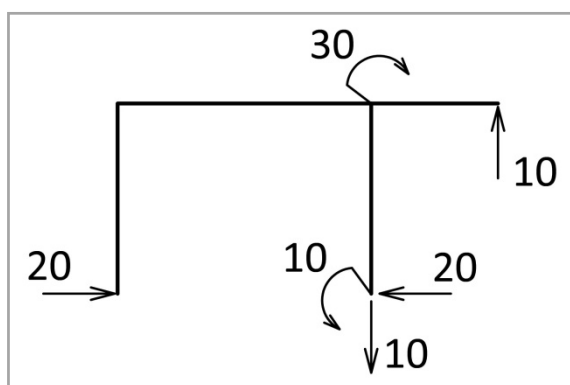
6)



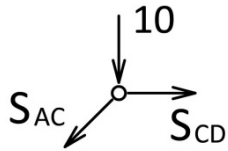
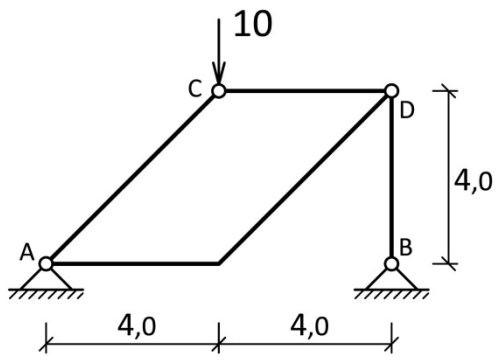
$$\sum F_X = 0 : X_A + 20 = 0 \rightarrow \underline{X_A = -20}$$

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

$$\sum M_A = 0 : M_A + 10 \cdot 2 - 30 = 0 \rightarrow \underline{M_A = 10}$$



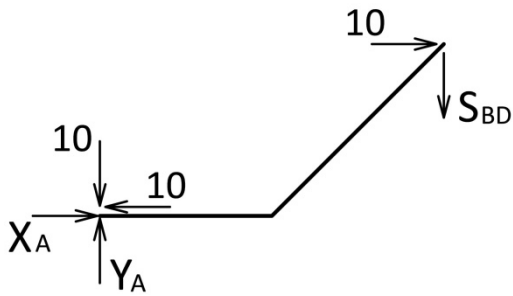
B)



$$\sum F_Y = 0 : -10 - 0.707 \cdot S_{AC} = 0 \rightarrow \underline{S_{AC} = -14.142}$$

(0.707 S<sub>AC</sub> = -10)

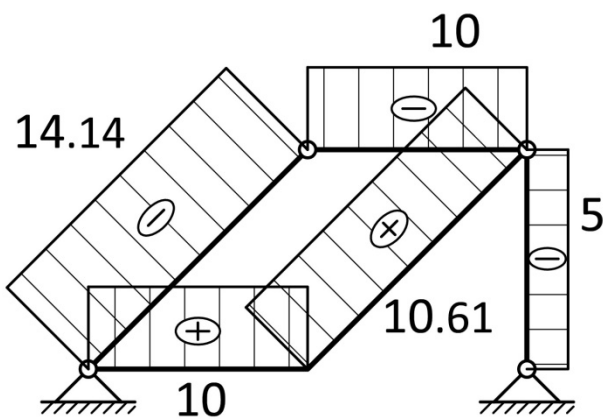
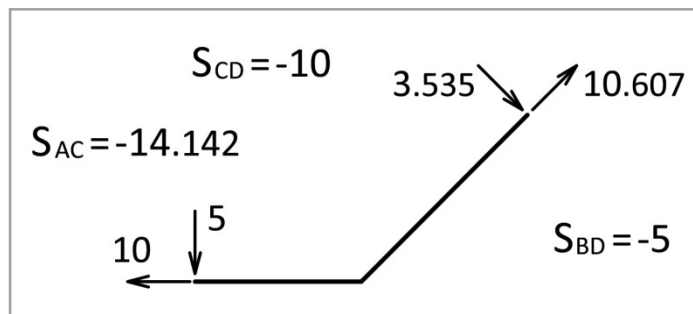
$$\sum F_X = 0 : S_{CD} - 0.707 \cdot S_{AC} = 0 \rightarrow \underline{S_{CD} = -10}$$



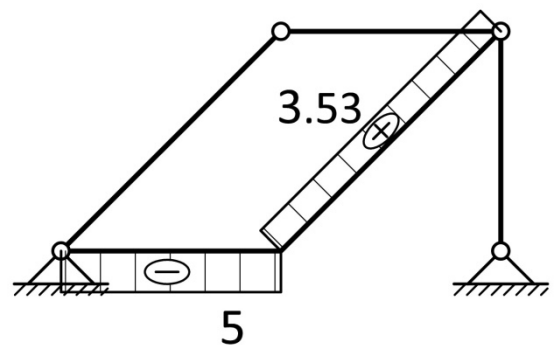
$$\sum F_X = 0 : X_A - 10 + 10 = 0 \rightarrow \underline{X_A = 0}$$

$$\sum M_A = 0 : S_{BD} \cdot 8 + 10 \cdot 4 = 0 \rightarrow \underline{S_{BD} = -5}$$

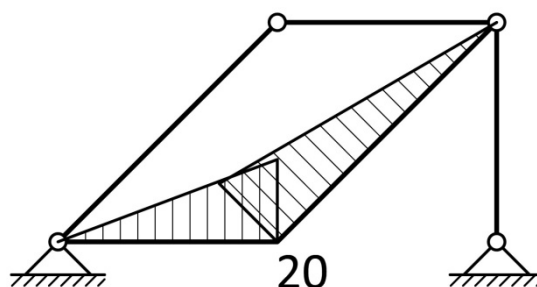
$$\sum F_Y = 0 : Y_A - S_{BD} - 10 = 0 \rightarrow \underline{Y_A = 5}$$



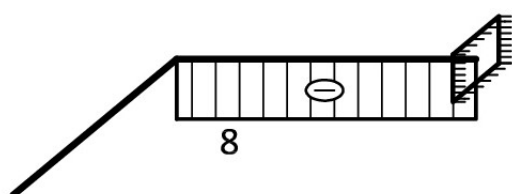
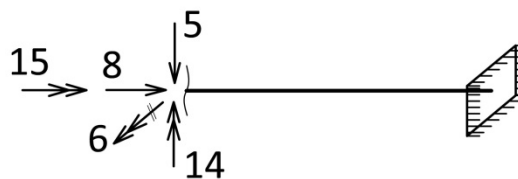
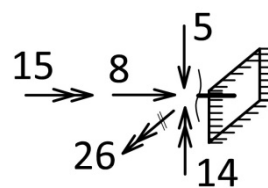
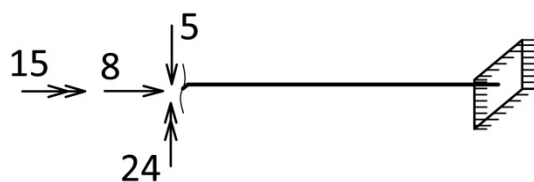
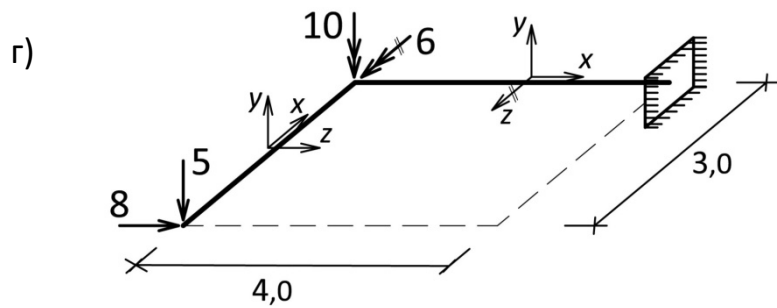
N



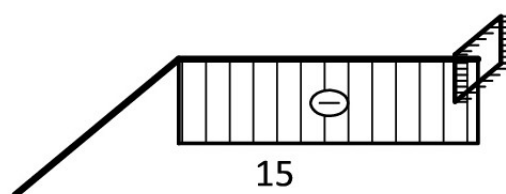
T



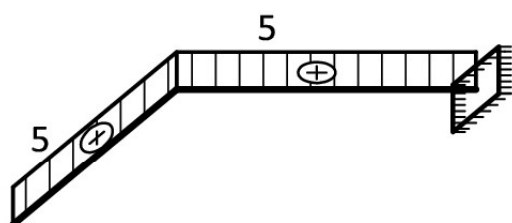
M



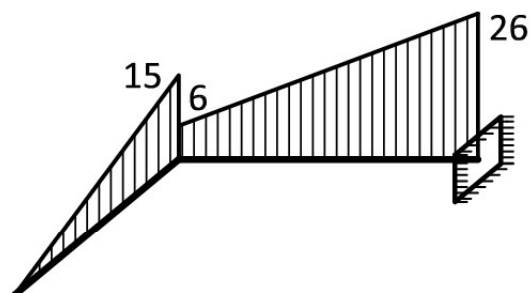
N



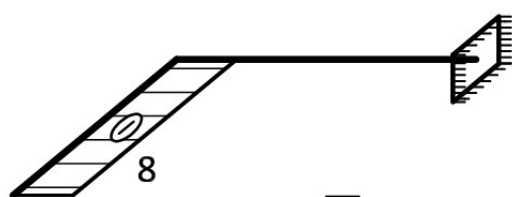
$M_t$



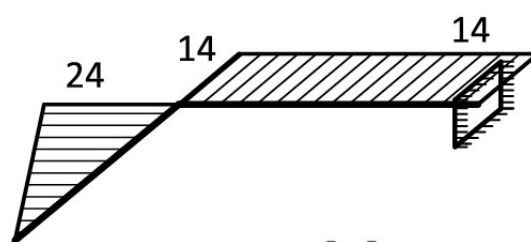
$T_y$



$M_z$



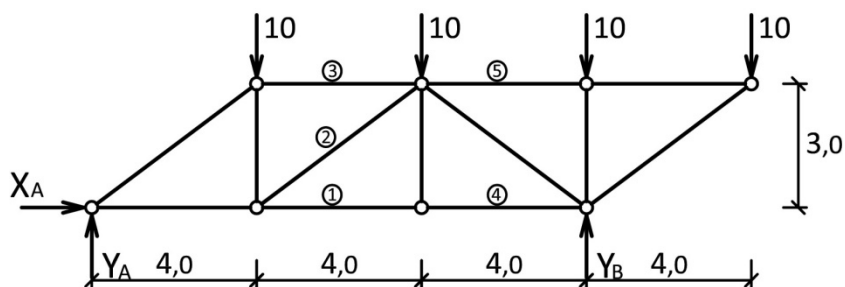
$T_y$



$M_z$

## 2. ЗАДАТАК (30 %)

б)

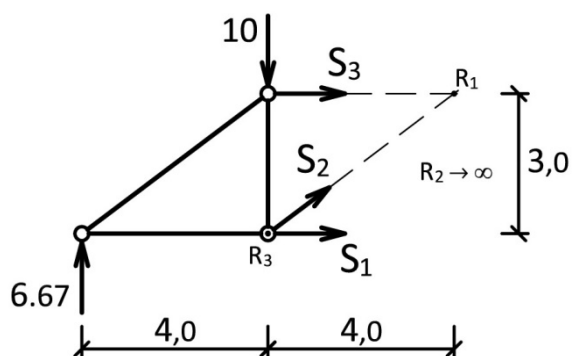


$$\sum F_X = 0 : \rightarrow \underline{X_A = 0}$$

$$\sum M_A = 0 : Y_B \cdot 12 - 10 \cdot 16 - 10 \cdot 12 - 10 \cdot 8 - 10 \cdot 4 = 0 \rightarrow \underline{Y_B = 33.33}$$

$$\sum F_Y = 0 : Y_A + Y_B - 10 - 10 - 10 - 10 = 0 \rightarrow \underline{Y_A = 6.67}$$

Ритеров поступак:



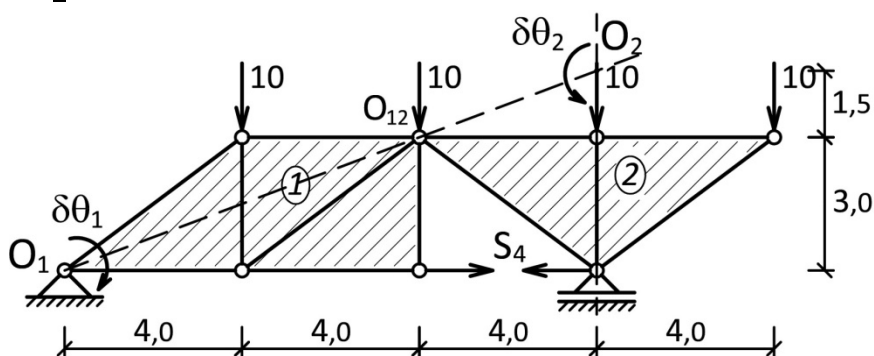
$$\sum M_{R1} = 0 : S_1 \cdot 3 + 10 \cdot 4 - 6.67 \cdot 8 = 0 \rightarrow \underline{S_1 = 4.44}$$

$$\sum F_Y = 0 : 0.6 \cdot S_2 - 10 + 6.67 = 0 \rightarrow \underline{S_2 = 5.56}$$

$$\sum M_{R3} = 0 : S_3 \cdot 3 + 6.67 \cdot 4 = 0 \rightarrow \underline{S_3 = -8.89}$$

в)

$$\underline{S_4 = ?}$$



$$\delta r_{O12,Y} = \delta \theta_1 \cdot 8$$

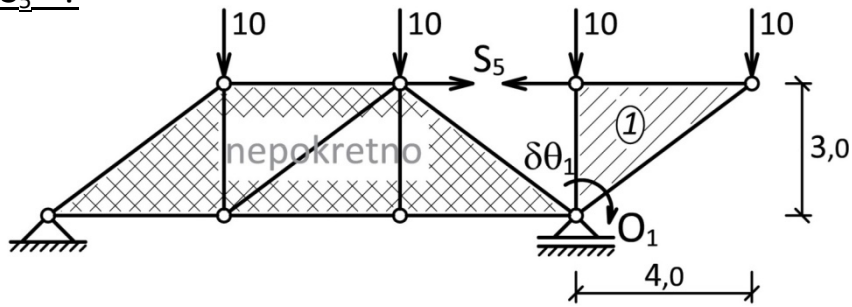
$$\delta r_{O12,Y} = \delta \theta_2 \cdot 4$$

$$\rightarrow \delta \theta_2 = 2 \cdot \delta \theta_1$$

$$\delta A = 10 \cdot (4 \cdot \delta \theta_1) + 10 \cdot (8 \cdot \delta \theta_1) - S_4 \cdot (4.5 \cdot \delta \theta_2) - 10 \cdot (4 \cdot \delta \theta_2) = 0$$

$$\rightarrow \underline{S_4 = 4.44}$$

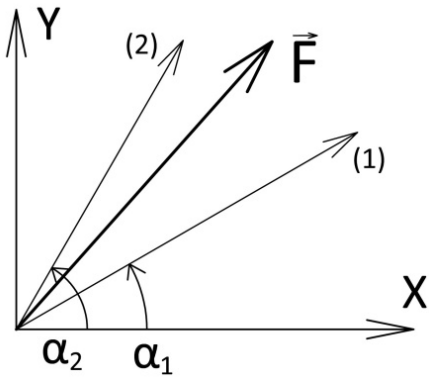
$$S_5 = ?$$



$$\delta A = -S_5 \cdot (3 \cdot \delta \theta_1) + 10 \cdot (4 \cdot \delta \theta_1) = 0 \rightarrow S_5 = 13.33$$

### 3. ЗАДАТАК (20 %)

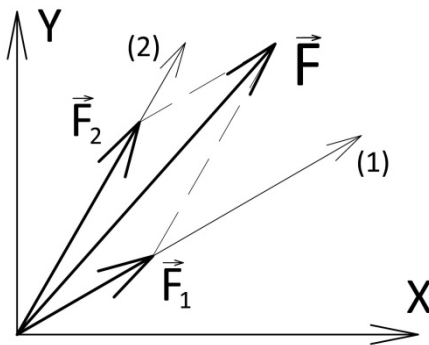
6)



$$\vec{F} = \{80, 90\}$$

$$\alpha_1 = 30^\circ$$

$$\alpha_2 = 60^\circ$$



$$\vec{F} = \vec{F}_1 + \vec{F}_2 \begin{cases} \cdot \vec{i} \\ \cdot \vec{j} \end{cases} \rightarrow \begin{cases} F_x = F_1 \cdot \cos \alpha_1 + F_2 \cdot \cos \alpha_2 \\ F_y = F_1 \cdot \sin \alpha_1 + F_2 \cdot \sin \alpha_2 \end{cases}$$

$$\rightarrow 80 = F_1 \cdot 0.866 + F_2 \cdot 0.5$$

$$\rightarrow 90 = F_1 \cdot 0.5 + F_2 \cdot 0.866$$

$$\rightarrow F_1 = 48,56 \quad F_2 = 75,88$$