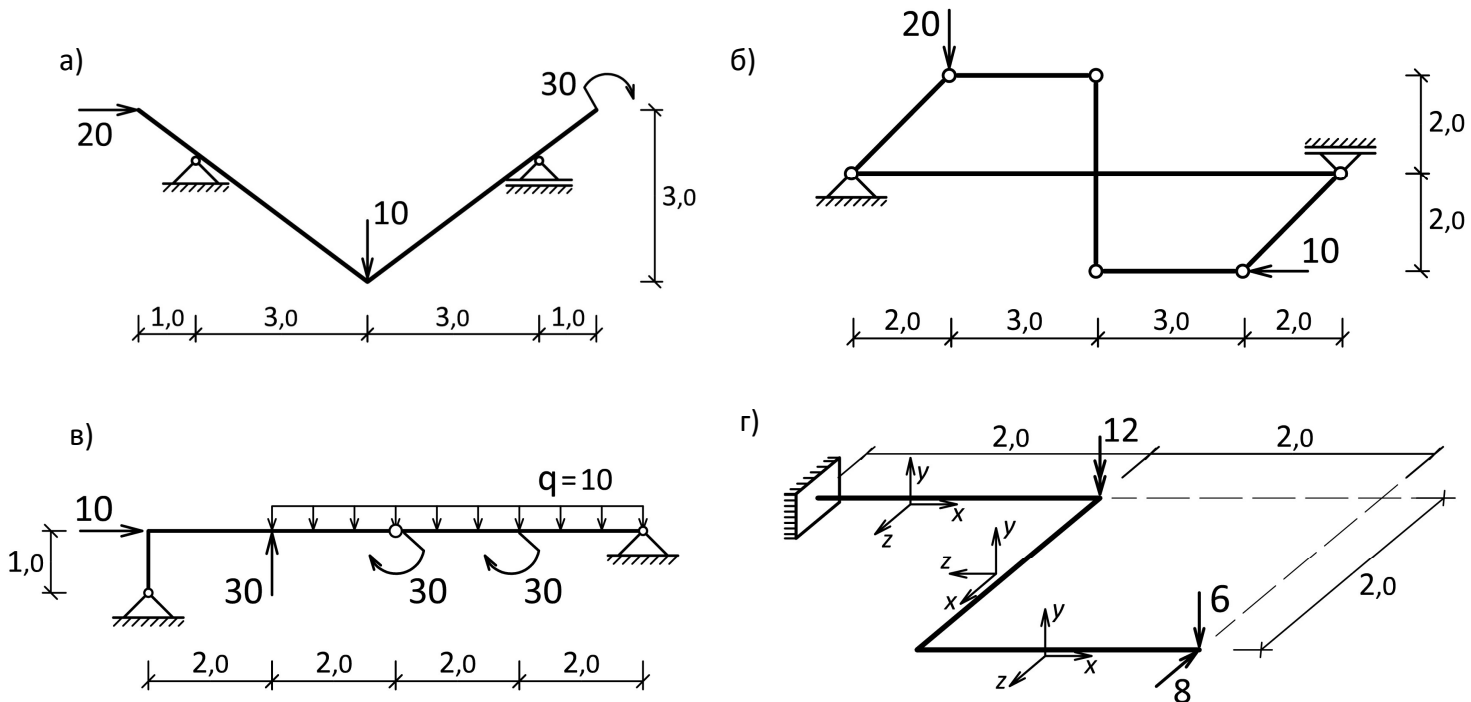


ГРАЂЕВИНСКИ ФАКУЛТЕТ УНИВЕРЗИТЕТА У БЕОГРАДУ
 Усмени (теоријски) део испита из **ТЕХНИЧКЕ МЕХАНИКЕ 1**
 (писмени део одржан 21.08.2018.)

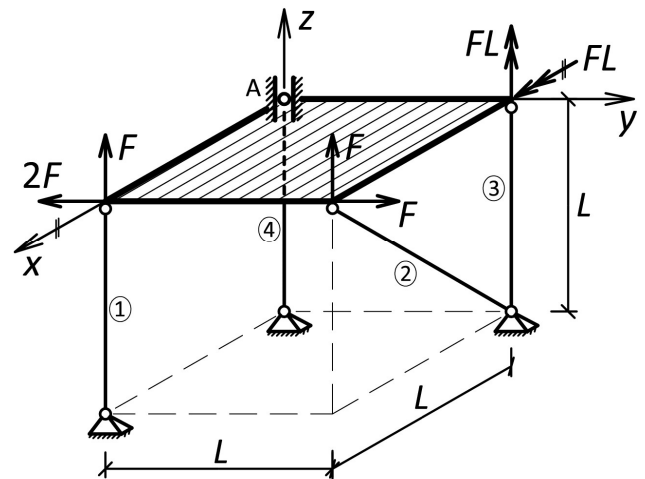
1. ЗАДАТАК (условни 50 %)

Нацртати дијаграме сила у пресеку за приказане носаче.



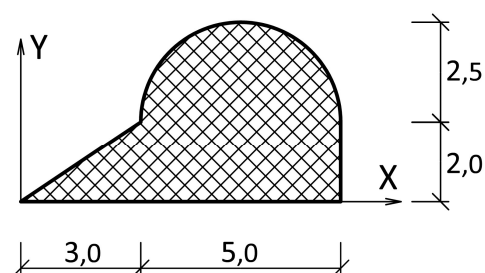
2. ЗАДАТАК (30 %)

- а) Приказати алтернативне облике услова равнотеже.
- б) Одредити реакције веза и вредности сила у штаповима за приказану плочу. Наћи максималну вредност параметра оптерећења F из услова да максимална сила у притиснутим штаповима не прелази 50kN, а у затегнутим 80 kN.



3. ЗАДАТАК (20 %)

- а) Објаснити шта је то тежиште тела.
- б) Одредити тежиште сложене равне фигуре приказане на слици.

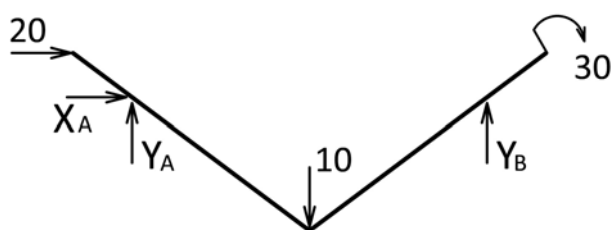
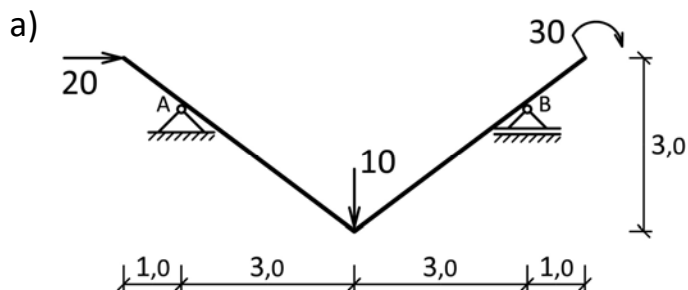


Напомена: У свим задацима димензије за дужине и силе су: m, kN

ГРАЂЕВИНСКИ ФАКУЛТЕТ УНИВЕРЗИТЕТА У БЕОГРАДУ
 Усмени (теоријски) део испита из **ТЕХНИЧКЕ МЕХАНИКЕ 1**
 (писмени део одржан 21.08.2018.)

- Р Е Ш Е Њ А -

1. ЗАДАТАК (условни 50 %)

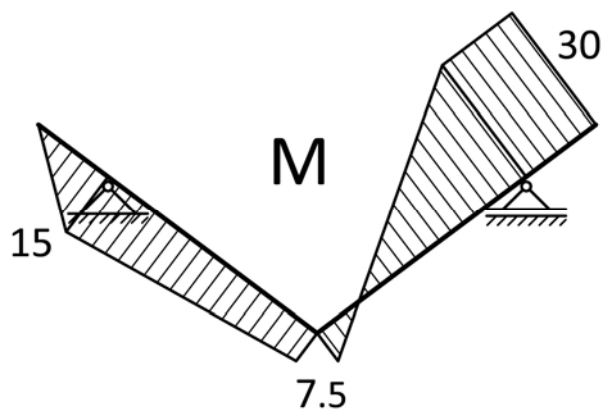
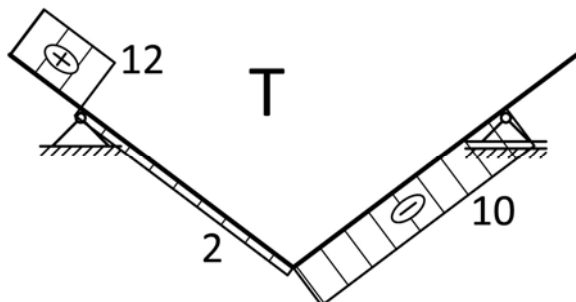
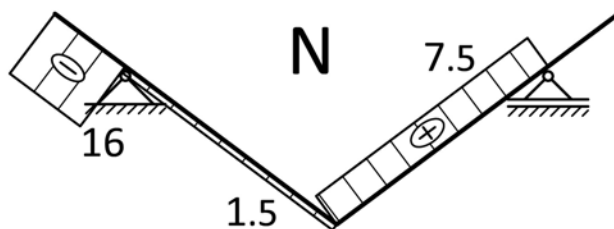
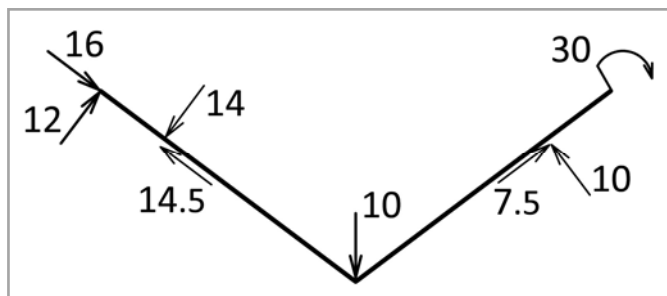


$$\sum F_x = 0 : X_A + 20 = 0 \rightarrow \underline{X_A = -20}$$

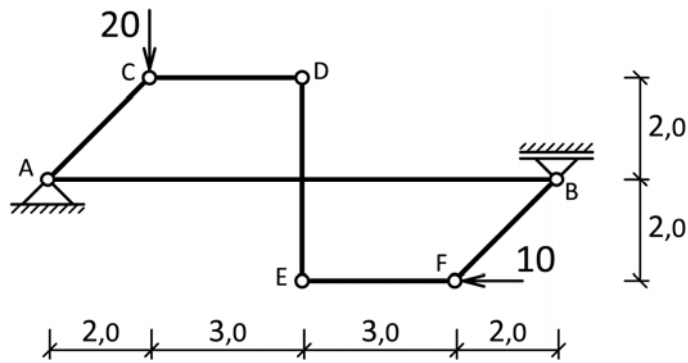
$$\sum M_A = 0 : Y_B \cdot 6 - 20 \cdot 0.75 - 10 \cdot 3 - 30 = 0$$

$$\rightarrow \underline{Y_B = 12.5}$$

$$\sum F_y = 0 : Y_A + Y_B - 10 = 0 \rightarrow \underline{Y_A = -2.5}$$

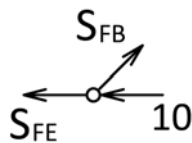


6)



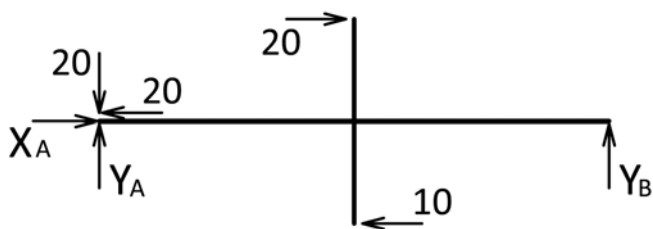
$$\sum F_Y = 0 : -0.707 \cdot S_{CA} - 20 = 0 \rightarrow \underline{S_{CA} = -28.28}$$

$$\sum F_X = 0 : -0.707 \cdot S_{CA} + S_{CD} = 0 \rightarrow \underline{S_{CD} = -20}$$



$$\sum F_Y = 0 : \rightarrow \underline{S_{FB} = 0}$$

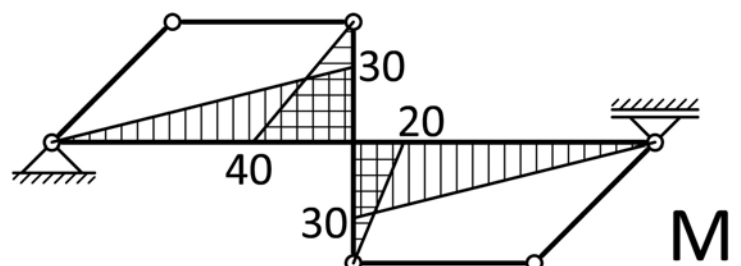
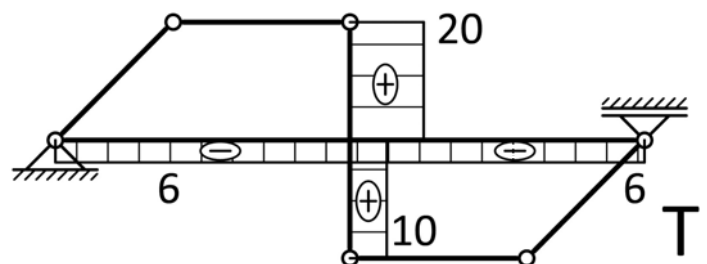
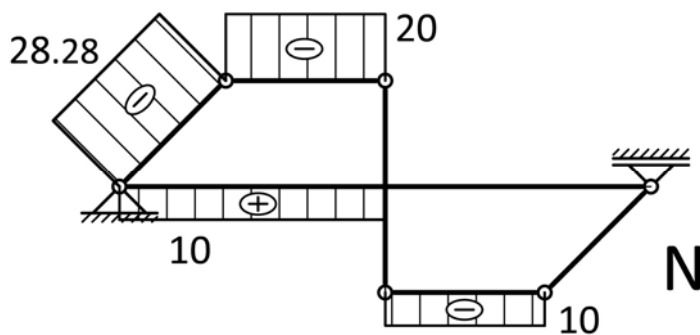
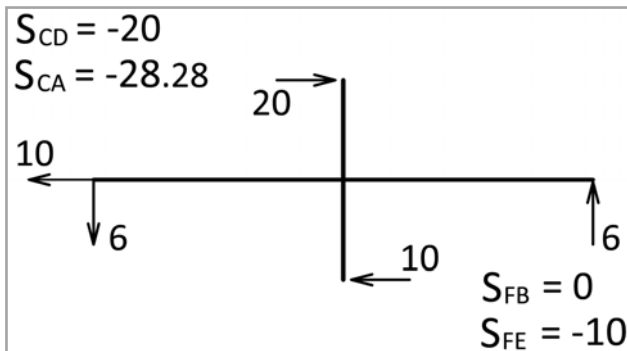
$$\sum F_X = 0 : -S_{FE} + 0.707 \cdot S_{FB} - 10 = 0 \rightarrow \underline{S_{FE} = -10}$$

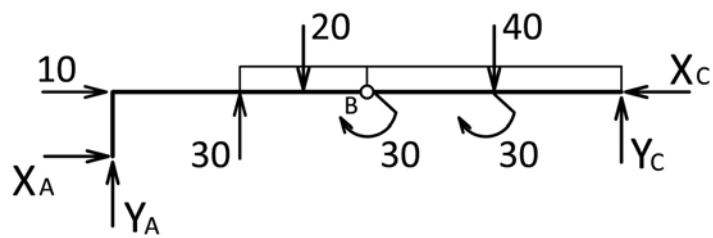
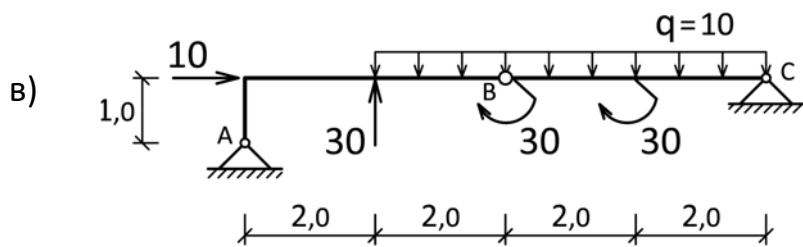


$$\sum F_X = 0 : X_A - 20 + 20 - 10 = 0 \rightarrow \underline{X_A = 10}$$

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

$$\sum F_Y = 0 : Y_A + Y_B - 20 = 0 \rightarrow \underline{Y_A = 14}$$



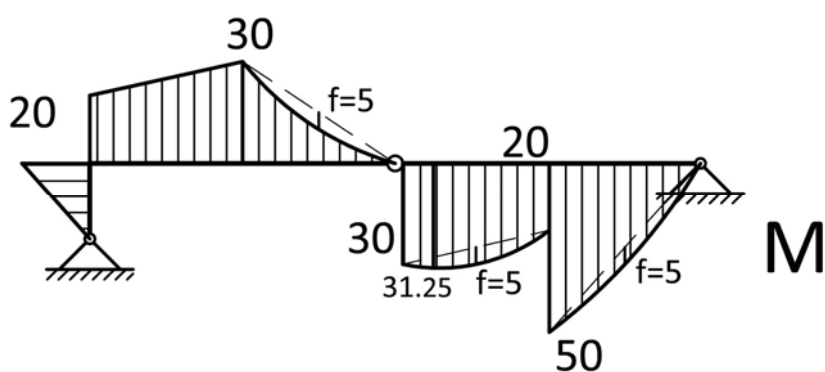
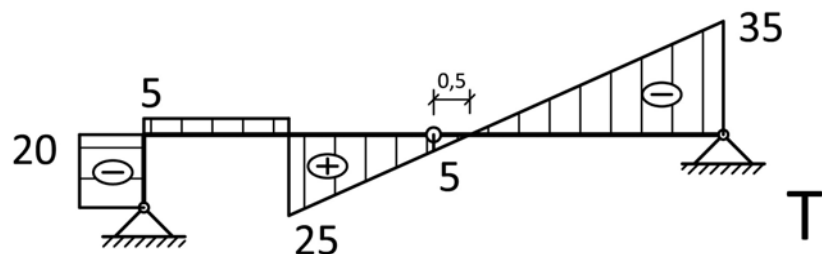
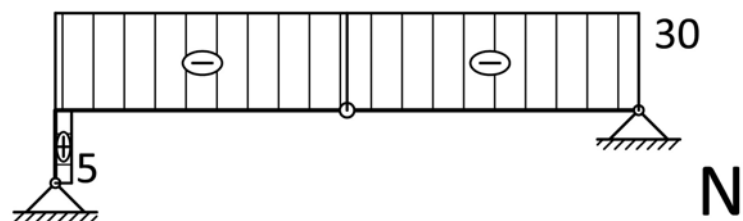
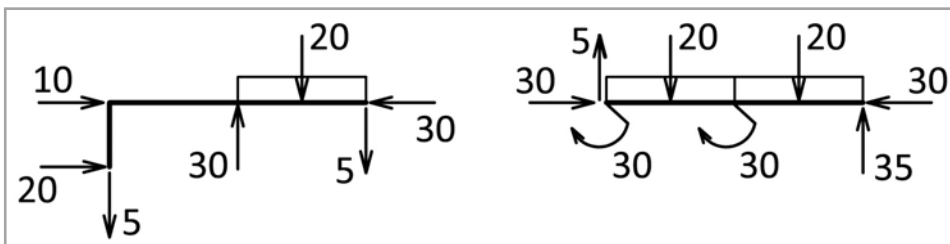


$$\sum M_{B, \text{дес}} = 0 : Y_C \cdot 4 - 40 \cdot 2 - 30 - 30 = 0 \rightarrow \underline{Y_C = 35}$$

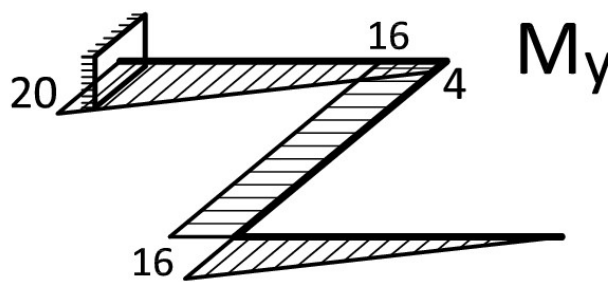
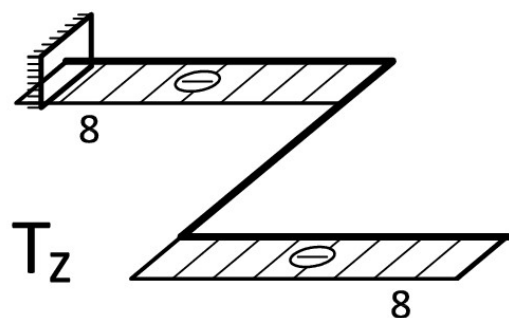
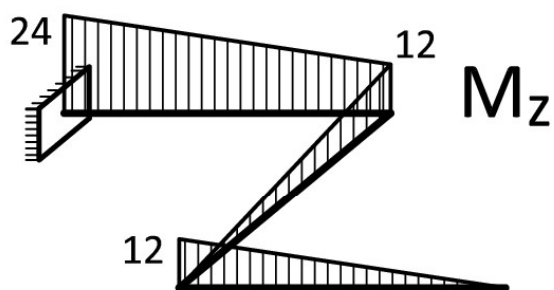
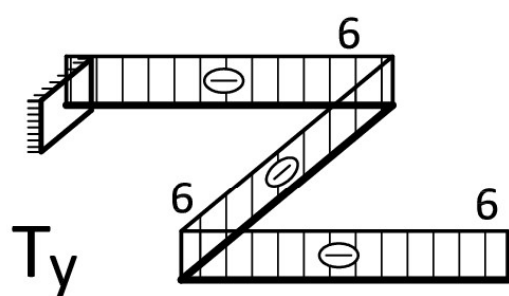
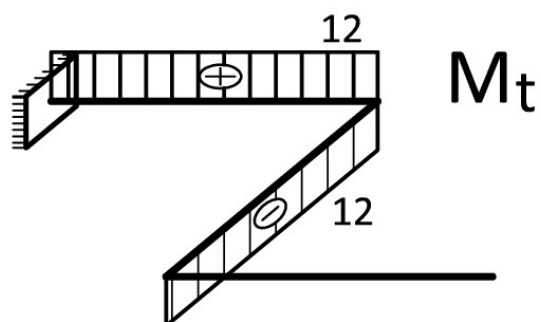
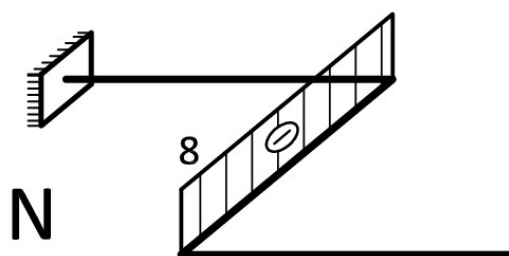
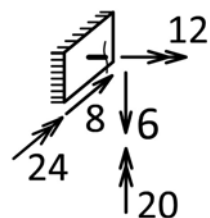
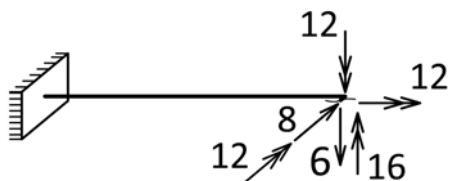
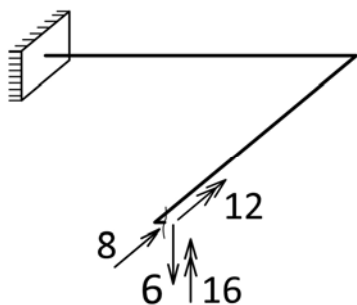
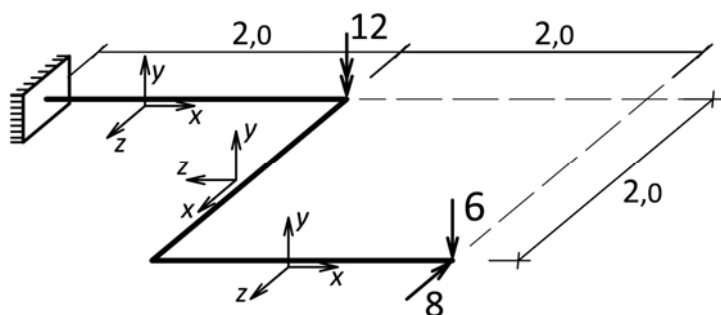
$$\sum F_Y = 0 : Y_A + Y_C + 30 - 20 - 20 = 0 \rightarrow \underline{Y_A = -5}$$

$$\sum M_{B, \text{лев}} = 0 : X_A \cdot 1 - Y_A \cdot 4 - 30 \cdot 2 + 20 \cdot 1 = 0 \rightarrow \underline{X_A = 20}$$

$$\sum F_X = 0 : X_A - X_C + 10 = 0 \rightarrow \underline{X_C = 30}$$

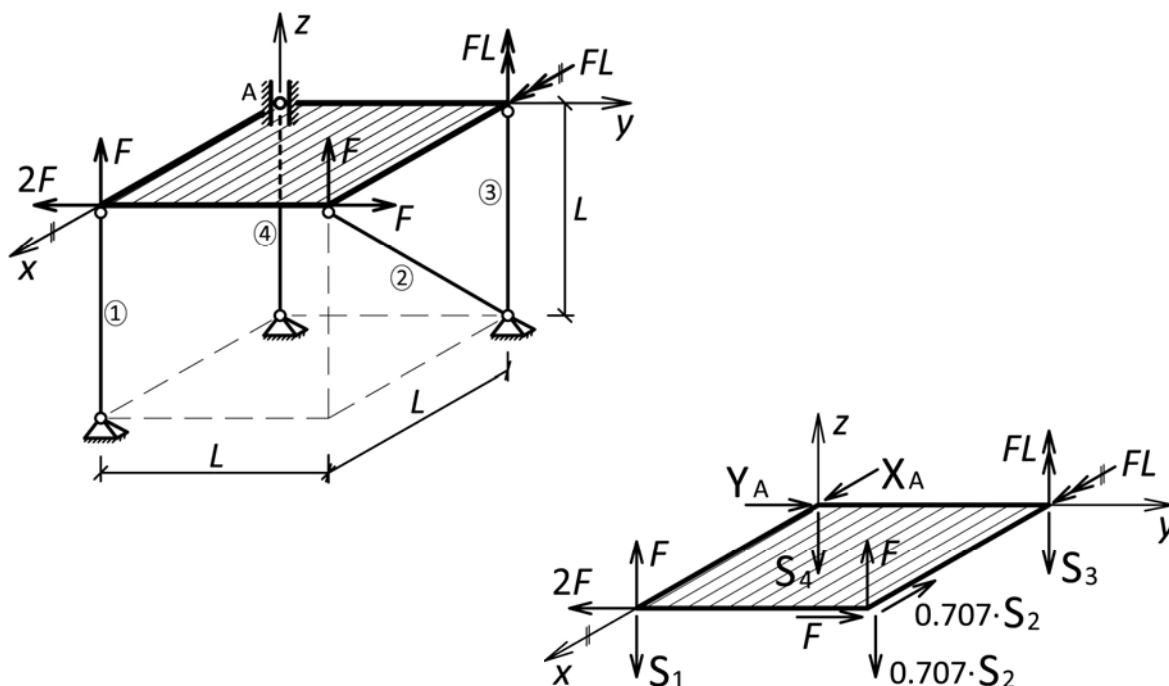


r)



2. ЗАДАТАК (30 %)

6)



$$\sum F_x = 0 : X_A - 0.707 \cdot S_2 = 0 \quad \rightarrow \quad \underline{X_A = 0}$$

$$\sum F_y = 0 : Y_A - 2F + F = 0 \quad \rightarrow \quad \underline{Y_A = F}$$

$$\sum F_z = 0 : -S_1 - 0.707 \cdot S_2 - S_3 - S_4 + F + F = 0 \quad \rightarrow \quad \underline{S_4 = -2F}$$

$$\sum M_x = 0 : -0.707 \cdot S_2 \cdot L - S_3 \cdot L + F \cdot L + FL = 0 \quad \rightarrow \quad \underline{S_3 = 2F}$$

$$\sum M_y = 0 : S_1 \cdot L + 0.707 \cdot S_2 \cdot L - F \cdot L - F \cdot L = 0 \quad \rightarrow \quad \underline{S_1 = 2F}$$

$$\sum M_z = 0 : 0.707 \cdot S_2 \cdot L + F \cdot L - 2F \cdot L + FL = 0 \quad \rightarrow \quad \underline{S_2 = 0}$$

Услов по притиску

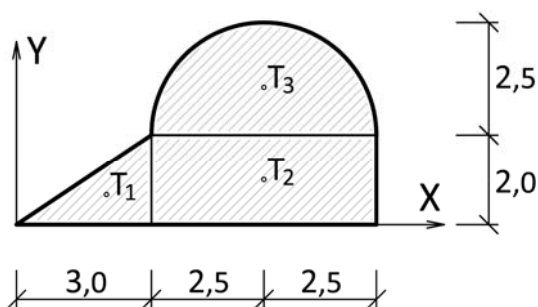
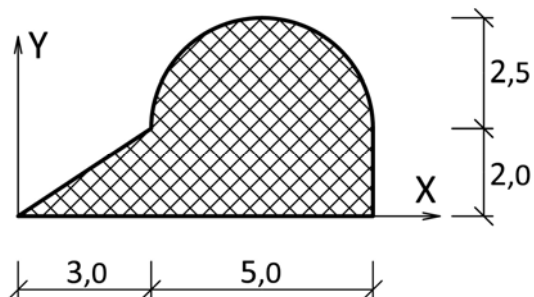
$$2F \leq 50 \text{ kN} \rightarrow F \leq 25 \text{ kN}$$

Услов по затезању

$$2F \leq 80 \text{ kN} \rightarrow F \leq 40 \text{ kN}$$

$$\left. \begin{array}{l} 2F \leq 50 \text{ kN} \rightarrow F \leq 25 \text{ kN} \\ 2F \leq 80 \text{ kN} \rightarrow F \leq 40 \text{ kN} \end{array} \right\} \rightarrow F \leq 25 \text{ kN}$$

3. ЗАДАТАК (20 %)



$$A_1 = \frac{1}{2} \cdot 3 \cdot 2 = 3, \quad x_{T,1} = 2.0, \quad y_{T,1} = 0.67$$

$$A_2 = 5 \times 2 = 10, \quad x_{T,2} = 5.5, \quad y_{T,2} = 1.0$$

$$A_3 = \frac{1}{2} \cdot 2.5^2 \pi = 9.82, \quad x_{T,3} = 5.5, \quad y_{T,3} = 3.06$$

$$A = \sum_{k=1}^3 A_k = 3 + 10 + 9.82 = 22.82$$

$$x_T = \frac{1}{A} \sum_{k=1}^3 x_k A_k = \frac{2.0 \cdot 3 + 5.5 \cdot 10 + 5.5 \cdot 9.82}{22.82} = 5.04$$

$$y_T = \frac{1}{A} \sum_{k=1}^3 y_k A_k = \frac{0.67 \cdot 3 + 1.0 \cdot 10 + 3.06 \cdot 9.82}{22.82} = 1.84$$

