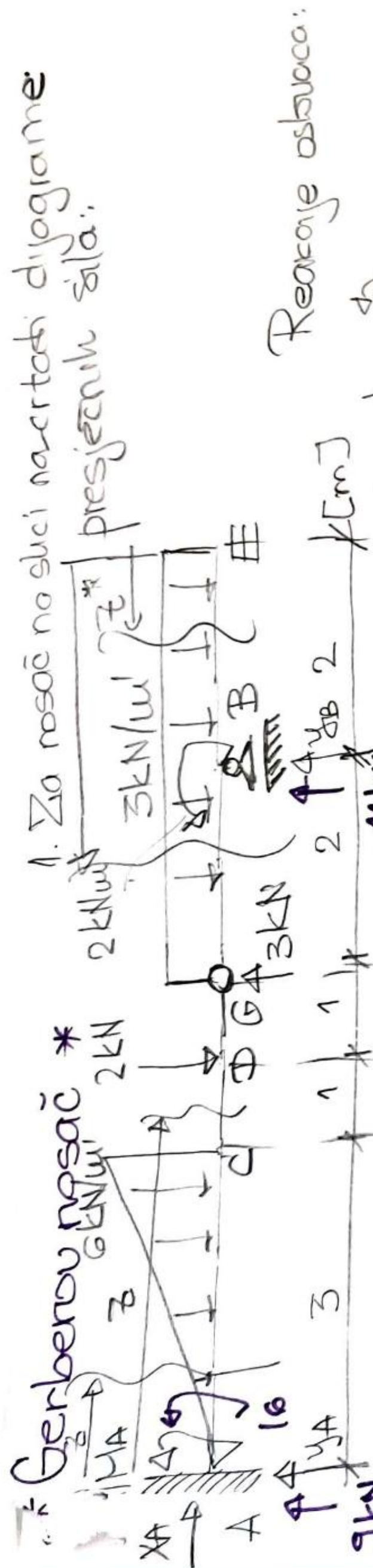


Gerbenov nosač *
1. Za nosač na slici nacrtati dijagrame presjernih sila:



Reakcije oslonoča:

$$\sum M_G = 0 \oplus$$

$$Y_B \cdot 2 + 2 - 3 \cdot 4 \cdot 2 = 0,$$

$$Y_B = 11 \text{ kN}$$

$$\sum M_A = 0 \oplus$$

$$M \cdot 7 + 2 - 3 \cdot 4 \cdot 7 + 3 \cdot 5 - 2 \cdot 4 - \frac{1}{2} \cdot 6 \cdot 3 \cdot \frac{2}{3} \cdot 3 + M_A = 0$$

$$M_A = 16 \text{ kNm}$$

$$\sum M_G' = 0 \ominus$$

$$Y_A \cdot 5 - 16 - \frac{1}{2} \cdot 6 \cdot 3 \cdot (\frac{1}{3} \cdot 3 + 2) - 2 \cdot 1 = 0,$$

$$Y_A = 9 \text{ kN}$$

$$\sum X_i = 0, \quad X_A = 0$$

Dio A-B:

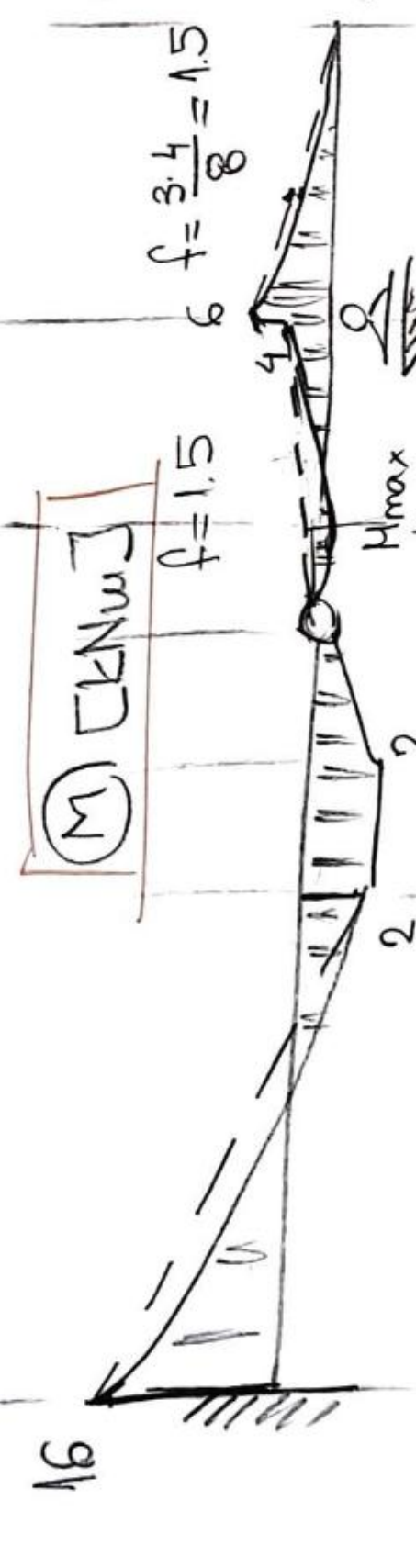
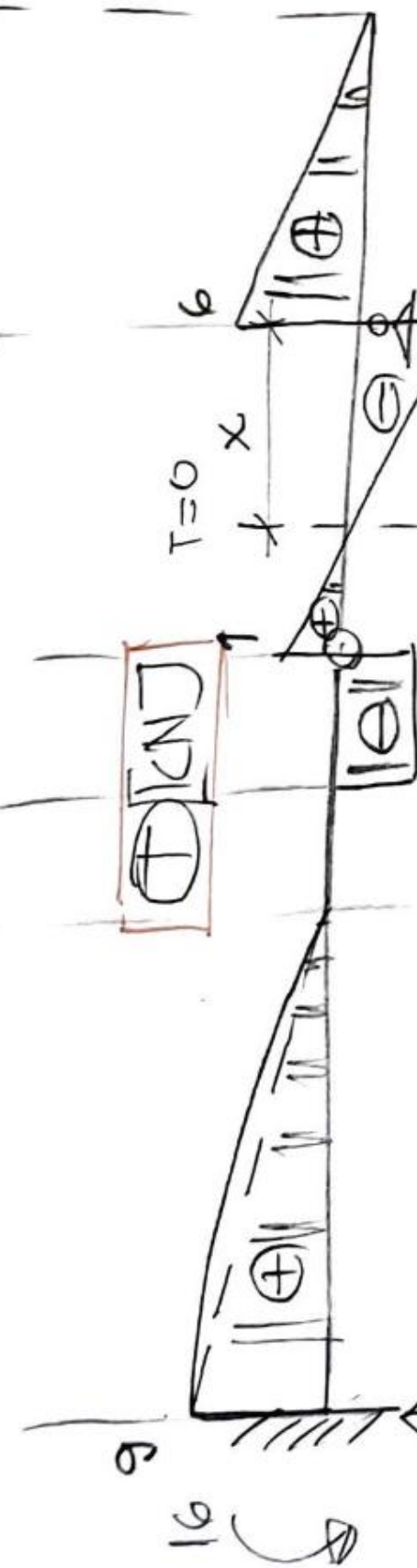
$$0 \leq z \leq 3$$

$$M(z) = -16 + 9z - \frac{1}{2} \cdot 3z \cdot z = \frac{1}{2}z^2 - 9z + 16$$

$$H(z) = -16 + 9z - \frac{z^2}{3}$$

$$T(z) = -\frac{z^2}{3} + 9z - 16$$

(kubna funkcija)
 $T(z) = M'(z) = \frac{2}{3}z - 9$
6 kvadratna p.



$$z: 3 \rightarrow 5$$

$$T(z) = -2z + 10$$

Dio C-D: $3 \leq z \leq 4$

$$M(z) = -16 + 9z - \frac{1}{2} \cdot 6 \cdot 3 \cdot (z - \frac{2}{3} \cdot 3)$$

$$M(z) = -16 + 9z - 9z + 18 = 2 \text{ kNm}$$

$$T(z) = 0$$

$$M(3) = 2, \quad T(3) = 0$$

$$M(0) = -16, \quad T(0) = 9$$

$$M(5) = 2, \quad T(5) = 0$$

$$M(z) = -16 + 9z - \frac{1}{2} \cdot 6 \cdot 3 \cdot (z - \frac{2}{3} \cdot 3)$$

$$T(z) = 0$$

$$M(4) = 2 \text{ kNm}, \quad M(5) = 0$$

$$T(4) = -2 = T(5)$$

2.10 E-B: (sa desave stave)

$$0 \leq z^* \leq 2$$

$$M(z^*) = -3 \cdot z^* \cdot \frac{z^*}{2} = -1,5 \cdot z^{*2}$$

$$T(z) = \underline{\underline{+3z^*}}$$

$$M(0) = 0$$

$$M(2) = -6 \text{ kNm}$$

$$T(0) = 0$$

$$T(2) = 6 \text{ kN}$$

2.10 B-G: $2 \leq z^* \leq 4$

$$M(z^*) = -3 \cdot z^* \cdot \frac{z^*}{2} + 11 \cdot (z^* - 2) + 3 \Rightarrow$$

$$M(z^*) = -1,5 z^{*2} + 11z^* - 22 + 3$$

$$M(z^*) = -1,5 z^{*2} + 11z^* - 20$$

$$\underline{\underline{T(z^*) = 3z^* - 11}}$$

$$M(2) = -4 \text{ kNm}; T(2) = -5$$

$$M(4) = 0; T(4) = 1 \text{ kN}$$

$$T=0 \Rightarrow M_{\max}$$

$$6:2 = 5:x$$

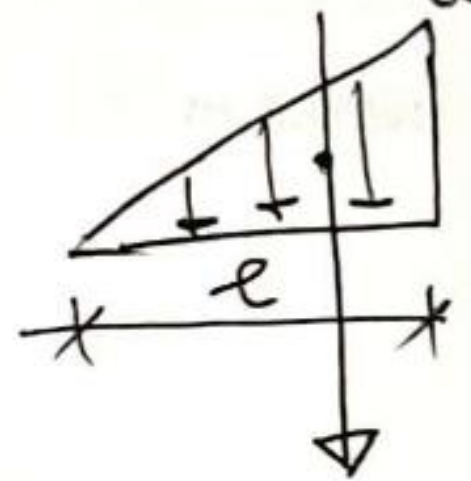
$$\underline{\underline{x = 1,66 \text{ m}}}$$

$$M_{\max} = -3 \cdot 3,6 \cdot \frac{3,6}{2} + 3 + 11 \cdot 1,6$$

$$M_{\max} = 1,167 \text{ kNm}$$

* napomena:

$$2l/3; l/3$$



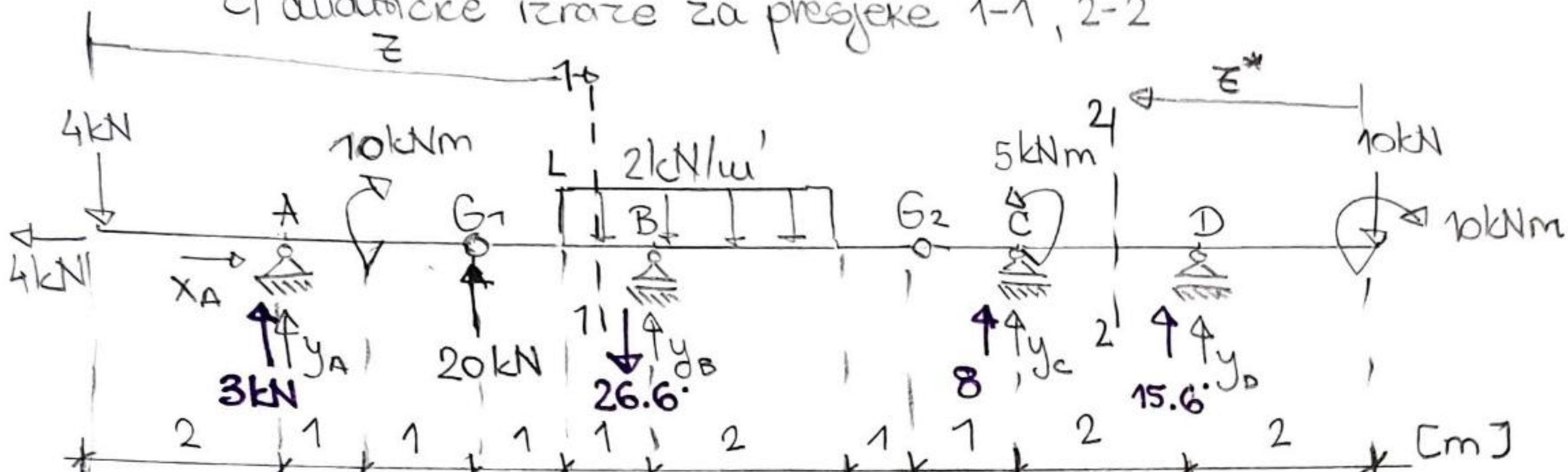
$$F_g = \frac{1}{2} \cdot q \cdot l$$

2. Za nosač i opterećenje na slici odrediti:

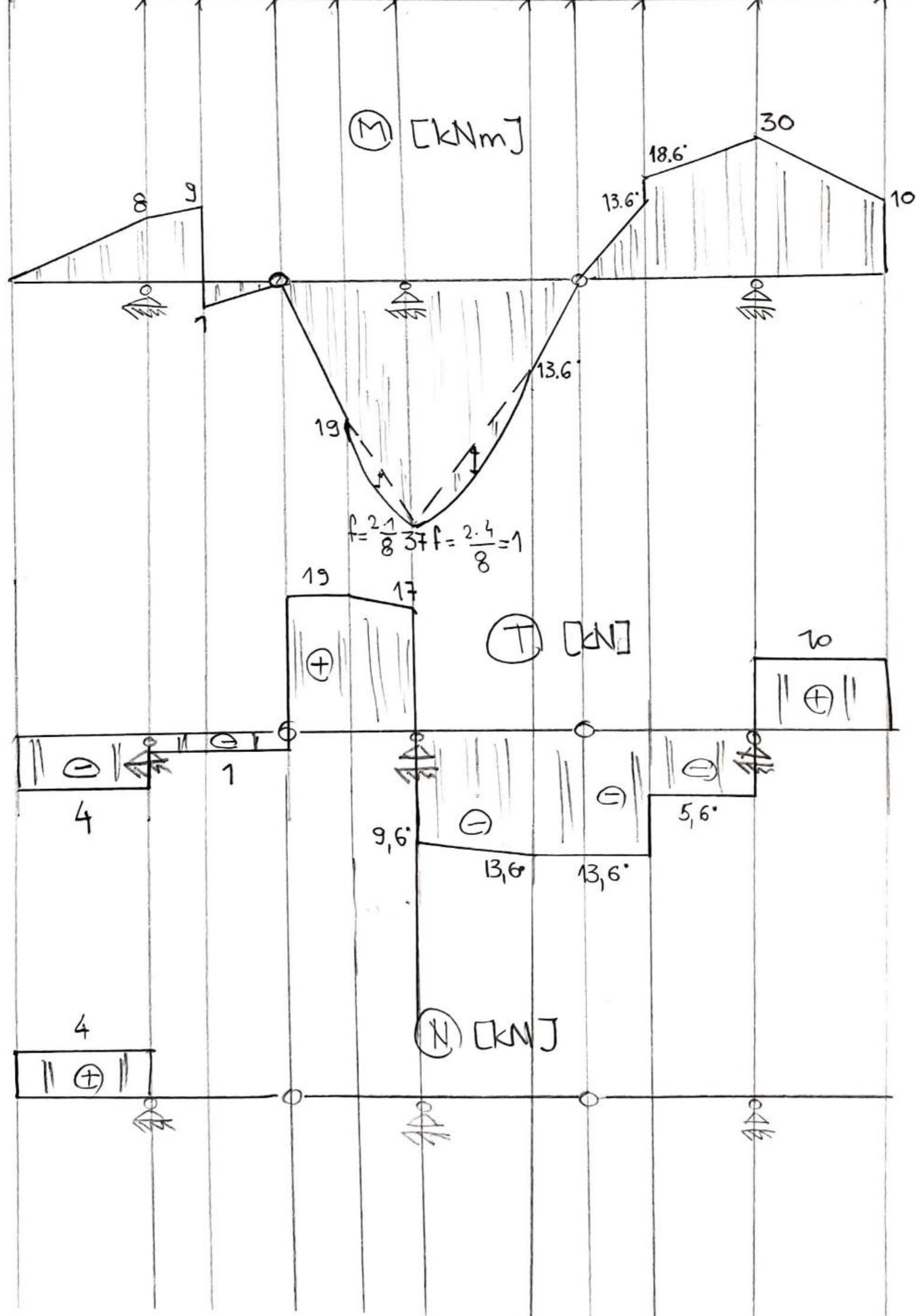
a) reakcije oslonaca

b) nacrtati dijagrame presječnih sila

c) auditičke izraze za presjeka 1-1, 2-2



b)



$$a) \sum X_i = 0, X_A - 4 = 0, X_A = 4 \text{ kN} \dots (1)$$

$$\textcircled{+} \sum M_{G_1}^L = 0, -4 \cdot 4 + y_A \cdot 2 + 10 = 0, y_A = 3 \text{ kN} \dots (2)$$

$$\textcircled{+} \sum M_{G_2}^L = 0, -4 \cdot 9 + 3 \cdot 7 + 10 - 2 \cdot 3 \cdot 2,5 + y_B \cdot 3 + 20 \cdot 5 = 0 \quad \boxed{y_B = -26,6 \text{ kN}} \quad (3)$$

$$\textcircled{+} \sum M_{G_2}^D = 0, -10 \cdot 5 - 10 + y_D \cdot 3 + 5 + y_C \cdot 1 = 0 \dots (4)$$

$$\textcircled{+} \sum M_{G_1}^D = 0, -10 \cdot 10 - 10 + y_D \cdot 8 + 5 + y_C \cdot 6 - 2 \cdot 3 \cdot 2,5 + (-26,6) \cdot 2 = 0 \dots (5)$$

$$\text{iz (4)} \Rightarrow \boxed{y_C = 55 - 3y_D}$$

$$\text{iz (5)} \Rightarrow -173,333 + y_D \cdot 8 + (55 - 3y_D) \cdot 6 = 0$$

$$-173,333 + 8y_D + 330 - 18y_D = 0, \quad y_D = 15,660 \text{ kN}, \quad \boxed{y_C = 8 \text{ kN}}$$

$$\text{*Kontrola: } \sum y_i = 0$$

$$-4 + 3 + 20 - 26,6 - 6 + 8 + 15,6 - 10 = 0 \text{ W}$$

c) presjek 1-1: dva L-B; $5 \leq z \leq 6$

$$\textcircled{+} M(z) = -4 \cdot z + 3(z-2) + 10 + 20 \cdot (z-4) - 2(z-5) \cdot (z-5) \Rightarrow$$

$$M(z) = -4z + 3z - 6 + 10 + 20z - 80 - (z^2 - 5z - 5z + 25)$$

$$M(z) = 29z - z^2 - 101$$

$$M(5) = 19 \text{ kNm W}$$

$$M(6) = 37 \text{ kNm W}$$

$$T(z) = M'(z) = 29 - 2z$$

$$T(5) = 19 \text{ kN}$$

$$T(6) = 17$$

*presjek 2-2:

-sadesne strane: dva C-D; $2 \leq z^* \leq 4$

$$\textcircled{+} M(z^*) = -10 - 10 \cdot z^* + 15,6 \cdot (z^* - 2) = -10 - 10 \cdot z^* + 15,6 \cdot z^* - 31,332$$

$$M(z^*) = 5,6 \cdot z^* - 41,332$$

$$M(2) = -30 \text{ kNm W}$$

$$M(4) = -18,665 \text{ kNm W}$$

$$T(z) = 5,6 \text{ W} \quad T(2) = T(4) = 5,6 \text{ kN W}$$