

Upload Tugas ke-10

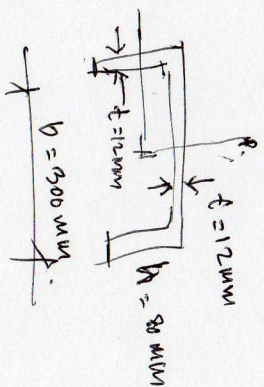
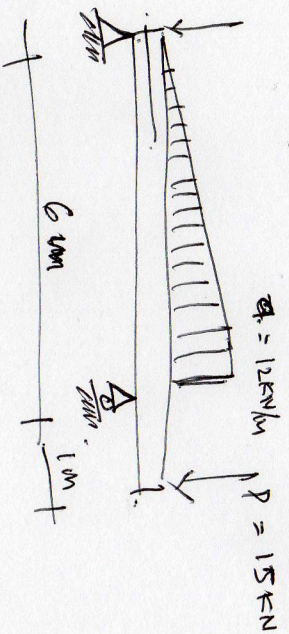
Nama : FIRMAN NURAHMAN

NIM : 192710042

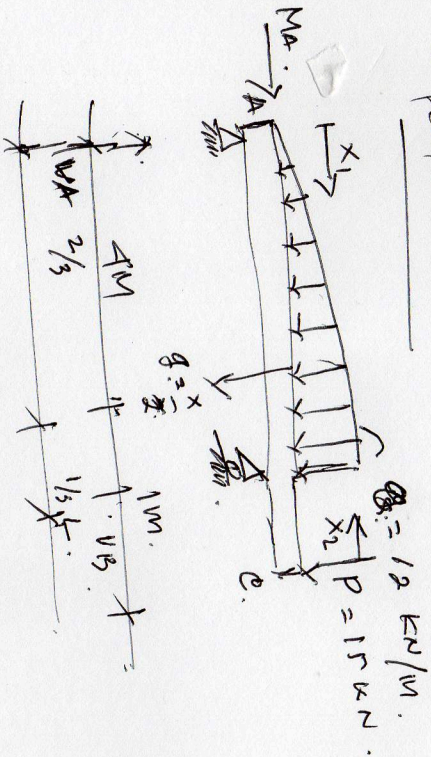
TUGAS : MEKANIKA TERAPAN. TUGAS KE 10.

ANGKARAN : 4 (Empat).

10. Sebuah balok dengan beban P_1 dan P_2 seperti tergambar. Penampang balok adalah berbentuk T dan dengan $b = 300 \text{ mm}$, $h = 80 \text{ mm}$ dan $t = 12 \text{ mm}$, hitunglah tegangan tarik dan tekan maksimum akibat beban tersebut.



1. penyelesaiannya :



STAPAT Keseluruhan.

$$\sum M = 0$$

$$\sum V = 0$$

$$\sum H = 0$$

* Perhitungan Reaksi Perantara *

$$\sum MB = 0$$

$$+ V_A \cdot 6 - \frac{qL}{2} \cdot \frac{1}{3}L + P \cdot 1 = 0$$

$$+ V_A \cdot 4 - \frac{12 \cdot 4}{2} \cdot \frac{4}{3} + 15 \cdot 1 = 0$$

$$+ V_A \cdot 4 + 24 \cdot \frac{4}{3} + 15 = 0$$

$$+ V_A = \frac{+32 - 15 \cdot \frac{17}{4}}{4} \text{ kN } (\uparrow)$$

$$\sum MA = 0$$

$$- V_B \cdot 4 + P \cdot 5 + \frac{qL}{2} \cdot \frac{2}{3}L = 0$$

$$- V_B \cdot 4 + 15 \cdot 5 + \frac{12 \cdot 4}{2} \cdot \frac{2 \cdot 4}{3} = 0$$

$$- V_B \cdot 4 + 75 + 24 \cdot \frac{8}{3} = 0$$

$$+ V_B = \frac{139}{4} \text{ kN } (\uparrow)$$

VA = 0
VB = 41

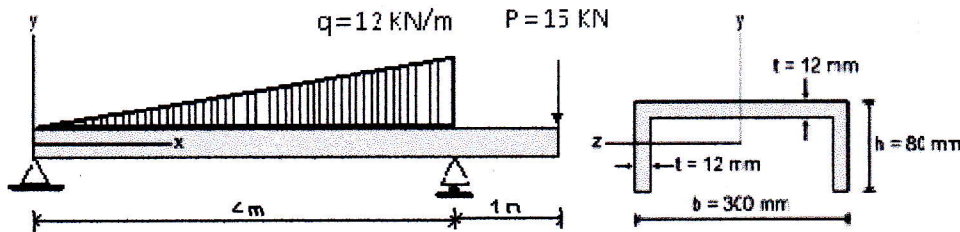
NAMA : Rahman Sahri

NIM : 192710044

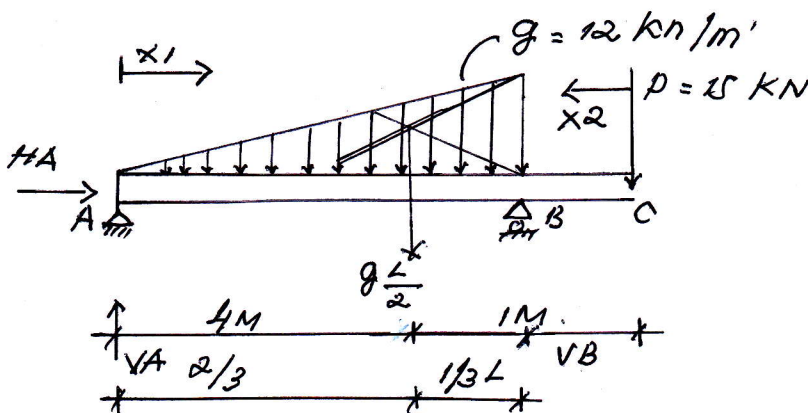
TUGAS : 70 (2)

Tugas Pertemuan ke-10

Sebuah balok dengan beban P_1 dan P_2 seperti tergambar. Penampang balok adalah berbentuk kanal dengan $b = 300$ mm, $h = 80$ mm dan $t = 12$ mm. Hitunglah tegangan tarik dan tekan maksimum akibat beban tersebut.



*) PENYELESAIAN



syarat keseimbangan

$$\Sigma M = 0$$

$$\Sigma V = 0$$

$$\Sigma H = 0$$

*) Perhitungan REAKSI PERLETAKAN

$$\Sigma MB = 0$$

$$+ V_A \cdot 4 - \frac{qL}{2} \cdot \frac{1}{3}L + P \cdot 1 = 0$$

$$+ V_A \cdot 4 - \frac{12 \cdot 4}{2} \cdot \frac{4}{3} + 15 \cdot 1 = 0$$

$$+ V_A \cdot 4 + 24 \cdot \frac{4}{3} + 15 = 0$$

$$+ V_A = + \frac{32 - 15}{4} = \frac{17}{4} \text{ kN (↑)}$$

$$\Sigma MA = 0$$

$$- V_B \cdot 4 + P \cdot 5 + \frac{qL}{2} \cdot \frac{2}{3}L = 0$$

$$- V_B \cdot 4 + 15 \cdot 5 + \frac{12 \cdot 4}{2} \cdot \frac{2 \cdot 4}{3} = 0$$

$$\Sigma V = 0$$

$$V_A + V_B - \frac{q \cdot L}{2} - P = 0$$

$$\frac{17}{4} + \frac{139}{4} - \frac{24}{2} - 15 = 0$$

$$4,25 + 26,75 - 29 - 15 = 0$$

$$4,25 + 26,75 - 39 = 0$$

$$39 - 39 = 0$$

$$0 = 0 \text{ Oke}$$

$$\Sigma H_A = 0$$

$$H_A - 0 = 0$$

$$H_A = (\rightarrow)$$

NAMA : Rahman Sahri

NIM : 192710044.

TUGAS : 70 (2) Samsungan...

PERHITUNGAN BIDANG MOMEN. (M_{x1})

Tinjau batang AB ($0 \leq x_1 \leq 4$) diukur di titik A

$$M_{x1} + V_A \cdot x_1 - Q \cdot x_1 \cdot \frac{1}{3} x_1$$

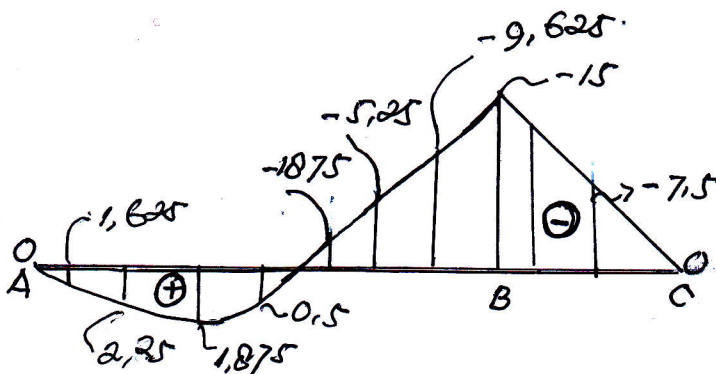
$$M_{x1} = \frac{17}{4} - \frac{9 \cdot x_1}{2} \cdot \frac{1}{3} x_1$$

$$= \frac{17}{4} x_1 - \frac{12}{2} x_1 \cdot \frac{1}{3} x_1$$

x_1 (M)	0	0,5	1	1,5	2	2,5	3	3,5	4
M_{x1} (KNM)	0	1,625	2,25	1,875	0,5	-1,875	-5,25	-9,625	-15

Tinjau batang CB ($0 \leq x_2 \leq 1$) diukur di titik C

DIAGRAM MOMEN.



Berdasarkan perhitungan di atas dapat disimpulkan bahwa momen positif maksimum dan momen negatif maksimum masing-masing adalah = 2,25 KNM dan -15 KN

TUGAS-10

MEKANIKA TERAPAN (MTS 271201)



Oleh :

Nama : Saeman

NIM : 192710038

Dosen Program : Dr. Firdaus, ST., M.T

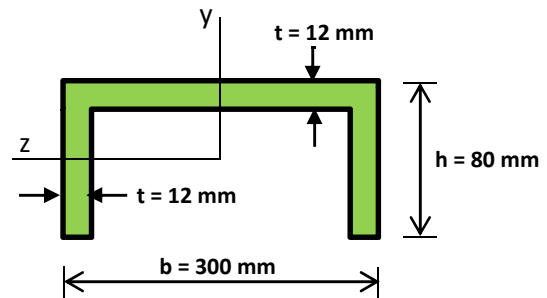
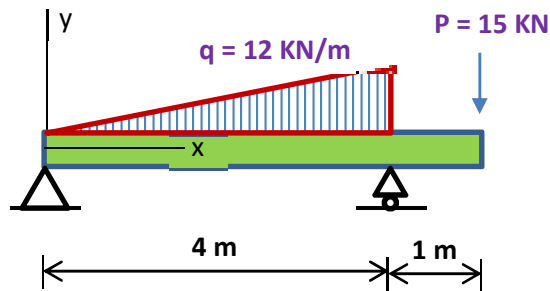
PROGRAM PASCASARJANA MAGISTER TEKNIK SIPIL

UNIVERSITAS BINA DARMA

2020

Tugas- 10

Sebuah balok dengan beban P_1 dan P_2 seperti tergambar. Penampang balok adalah berbentuk kanal dengan $b = 300 \text{ mm}$, $h = 80 \text{ mm}$ dan $t = 12 \text{ mm}$. Hitunglah tegangan tarik dan tekan maksimum akibat beban tersebut.

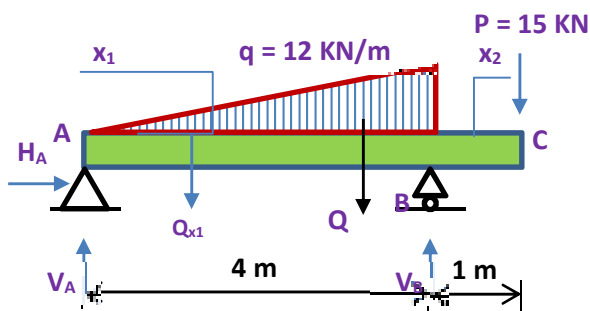


Jawab :

$$\sum M = 0$$

$$\sum V = 0$$

$$\sum H = 0$$



$$Q = \frac{q \cdot L}{2} = \frac{12 \text{ kN/m} \cdot 4 \text{ m}}{2} = 24 \text{ kN}$$

$$\frac{q_{x1}}{q} = \frac{x_1}{4} \rightarrow q_{x1} = \frac{12 \text{ kN/m}}{4 \text{ m}} x_1 = 3x_1 \text{ kN/m}^2$$

$$Q_{x1} = \frac{q_{x1} \cdot x_1}{2} = \frac{3x_1 \cdot x_1}{2} = 1,5 x_1^2 \text{ kN/m}^2$$

$$\sum M_A = 0$$

$$Q \cdot \frac{2}{3} \cdot 4 \text{ m} - V_B \cdot 4 \text{ m} + P \cdot 5 \text{ m} = 0 \rightarrow 24 \text{ kN} \cdot \frac{8}{3} \text{ m} - V_B \cdot 4 \text{ m} + 15 \text{ kN} \cdot 5 \text{ m} = 0$$

$$V_B \cdot 4 \text{ m} = 24 \text{ kN} \cdot \frac{8}{3} \text{ m} + 15 \text{ kN} \cdot 5 \text{ m} \rightarrow V_B = \frac{64 \text{ kN} \cdot \text{m} + 75 \text{ kN} \cdot \text{m}}{4 \text{ m}} \rightarrow V_B = 34,75 \text{ kN}$$

$$\sum M_B = 0$$

$$V_A \cdot 4 \text{ m} - Q \cdot \frac{1}{3} \cdot 4 \text{ m} + P \cdot 1 \text{ m} = 0 \rightarrow V_A \cdot 4 \text{ m} - 24 \text{ kN} \cdot \frac{4}{3} \text{ m} + 15 \text{ kN} \cdot 1 \text{ m} = 0$$

$$V_A \cdot 4 \text{ m} = 24 \text{ kN} \cdot \frac{4}{3} \text{ m} - 15 \text{ kN} \cdot 1 \text{ m} \rightarrow V_A = \frac{32 \text{ kN} \cdot \text{m} - 15 \text{ kN} \cdot \text{m}}{4 \text{ m}} \rightarrow V_A = 4,25 \text{ kN}$$

$$\text{kontrol : } \sum V = 0$$

$$V_A + V_B - 24 \text{ kN} - 15 \text{ kN} = 0 \rightarrow 4,25 \text{ kN} + 34,75 \text{ kN} - 24 \text{ kN} - 15 \text{ kN} = 0 \rightarrow 0 = 0 \text{ (ok)}$$

$$\sum H = 0$$

$$H_A = 0$$

❖ PERHITUNGAN BIDANG MOMEN (M_x)

Batang AB : $0 \leq x_1 \leq 4 \text{ m}$ diukur dari titik A

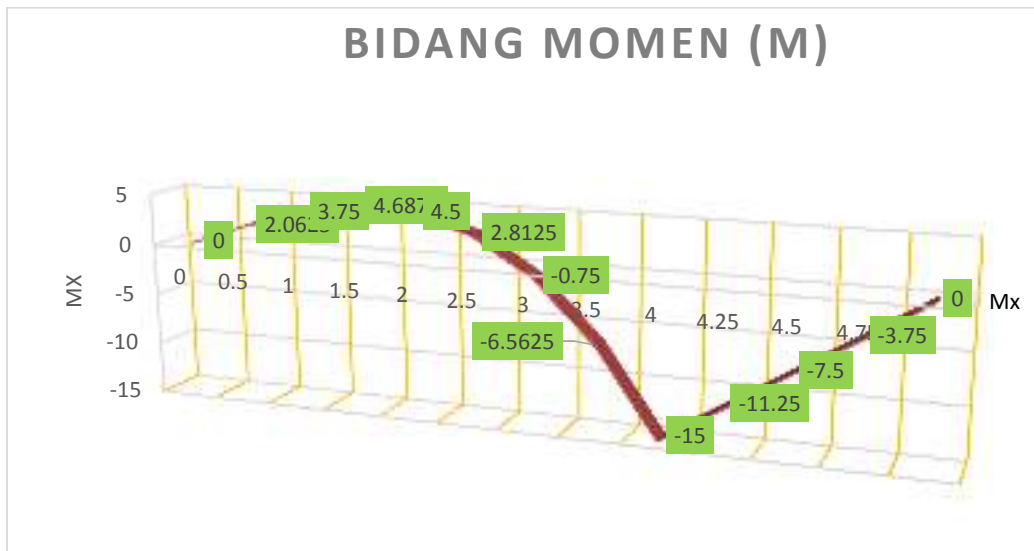
$$M_{x1} = V_A \cdot x_1 - Q_{x1} \cdot \frac{1}{3} x_1 \rightarrow M_{x1} = 4,25 \text{ kN} \cdot x_1 - 1,5 x_1^2 \frac{\text{kN}}{\text{m}^2} \cdot \frac{1}{3} x_1$$

x_1 (m)	0	0,5	1	1,5	2	2,5	3	3,5	4
M_{x1} (kN.m)	0	2,0625	3,75	4,6875	4,5	2,8125	-0,75	-	-15

Batang BC : $0 \leq x_2 \leq 1 \text{ m}$ diukur dari titik C

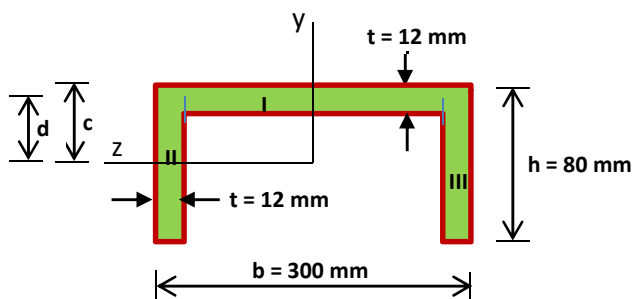
$$M_{x2} = -P \cdot x_2 = -15 \text{ kN} \cdot x_2$$

x_2 (m)	0	0,5	1
M_{x2} (kN.m)	0	-7,5	-15



Berdasarkan perhitungan di atas dapat disimpulkan bahwa momen positif maksimum dan negatif maksimum masing-masing adalah 4,6875 kN.m dan -15 kN.m.

❖ PERHITUNGAN MOMEN INERSIA



Dari sisi atas kiri :

$$c = \frac{(300 - 12 \cdot 2) \cdot 12 \cdot 6 + 80 \cdot 12 \cdot 40 \cdot 2}{(300 - 12 \cdot 2) \cdot 12 + 80 \cdot 12 \cdot 2} = 18,48 \text{ mm}$$

$$d = c - \frac{12}{2} = 18,48 \text{ mm} - \frac{12}{2} \text{ mm} = 12,48 \text{ mm}$$

$$A_1 = b \cdot t = 276 \text{ mm} \cdot 12 \text{ mm} = 3312 \text{ mm}^2$$

$$A_2 = A_3 = h \cdot t = 80 \text{ mm} \cdot 12 \text{ mm} = 960 \text{ mm}^2$$

$$I_{z1} = I_{zc} + A_1 \cdot d^2 \rightarrow I_{z1} = \frac{1}{12} b t^3 + A_1 \cdot d^2$$

$$I_{z1} = \frac{1}{12} 276 \cdot 12^3 + 3312 \cdot 12,48^2 = 555589,3 \text{ mm}^4$$

$$I_{z2} = I_{z3} = \frac{1}{12} t \cdot h^3 \rightarrow I_{z2} = I_{z3} = \frac{1}{12} 12 \cdot 80^3 = 512000 \text{ mm}^4$$

$$I_z = I_{z1} + I_{z2} + I_{z3} = 1579589,3 \text{ mm}^4$$

❖ TEGANGAN TARIK DAN TEKAN MAKSIMUM

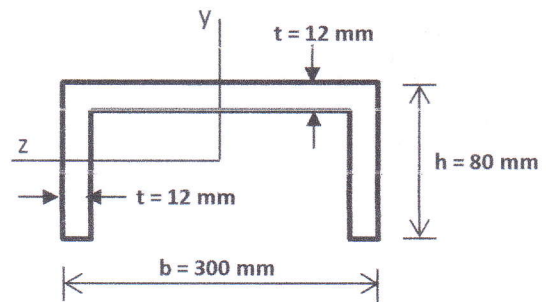
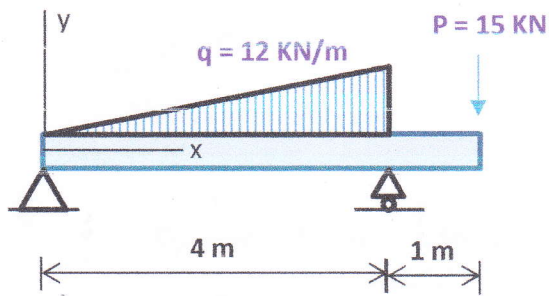
$$\text{Tegangan tarik maksimum : } \sigma_t = \frac{M \cdot c}{I} = \frac{4,6875 \cdot 10^6 \text{ N} \cdot \text{mm} \cdot 18,48 \text{ mm}}{1579589,3 \text{ mm}^4} = 54,84 \text{ MPa}$$

$$\text{Tegangan tekan maksimum : } \sigma_c = \frac{M \cdot c}{I} = \frac{-15 \cdot 10^6 \text{ N} \cdot \text{mm} \cdot 18,48 \text{ mm}}{1579589,3 \text{ mm}^4} = -175,49 \text{ MPa}$$

Nama Mahasiswa : Agus Rudiyanto/ 192710046/ MTS4
 Mata Kuliah : MEKANIKA TERAPAN (MTS271201)
 Dosen : Dr. Firdaus, M.T.
 Tugas : EL. 10

TUGAS 10 :

Sebuah balok dengan beban P_1 dan P_2 seperti tergambar. Penampang balok adalah berbentuk kanal dengan $b = 300 \text{ mm}$, $h = 80 \text{ mm}$ dan $t = 12 \text{ mm}$. Hitunglah tegangan tarik dan tekan maksimum akibat beban tersebut.

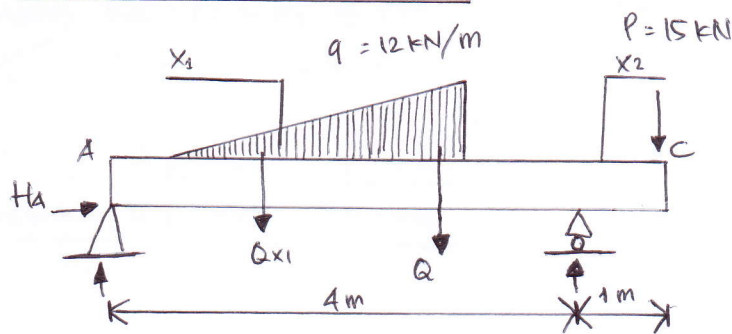


Jawab :

$$\sum M = 0$$

$$\sum V = 0$$

$$\sum H = 0$$



$$Q = \frac{q \cdot L}{2} = \frac{12 \text{ kN/m} \cdot 4 \text{ m}}{2} = 24 \text{ kN}$$

$$\frac{q \cdot x_1}{q} = \frac{x_1}{4} \rightarrow q \cdot x_1 = \frac{12 \text{ kN/m}}{4} x_1 = 3 x_1 \text{ kN/m}^2$$

$$Q_{x1} = \frac{q \cdot x_1 \cdot x_1}{2} = \frac{3 x_1 \cdot x_1}{2} = 1,5 x_1^2 \text{ kN/m}^2$$

$$Q \cdot \frac{2}{3} \cdot 4m - V_B \cdot 4m + P \cdot 5m = 0 \rightarrow 24 \text{ kN} \cdot \frac{8}{3} m - V_B \cdot 4m + 15 \text{ kN} \cdot 5m = 0$$

$$V_B \cdot 4m = 24 \text{ kN} \cdot \frac{8}{3} m + 15 \text{ kN} \cdot 5m \rightarrow V_B = \frac{64 \text{ kN} \cdot m + 75 \text{ kN} \cdot m}{4m} \rightarrow V_B = 34,75 \text{ kN}$$

$$\sum M_B = 0$$

$$V_A \cdot 4m - Q \cdot \frac{1}{3} \cdot 4m + P \cdot 1m = 0 \rightarrow V_A \cdot 4m - 24 \text{ kN} \cdot \frac{4}{3} m + 15 \text{ kN} \cdot 1m = 0$$

$$V_A \cdot 4m = 24 \text{ kN} \cdot \frac{4}{3} m - 15 \text{ kN} \cdot 1m \rightarrow V_A = \frac{32 \text{ kN} \cdot m - 15 \text{ kN} \cdot m}{4m} \rightarrow V_A = 4,25 \text{ kN}$$

$$\text{Kontrol : } \sum V = 0$$

$$V_A + V_B - 24 \text{ kN} - 15 \text{ kN} = 0 \rightarrow 4,25 \text{ kN} + 34,75 \text{ kN} - 24 \text{ kN} - 15 \text{ kN} = 0 \rightarrow 0 = 0 \text{ (OK)}$$

$$\sum H = 0$$

$$H_A = 0$$

Perhitungan Bidang Momen (mx)

Batang AB : $0 \leq x_1 \leq 4m$ diukur dari titik A

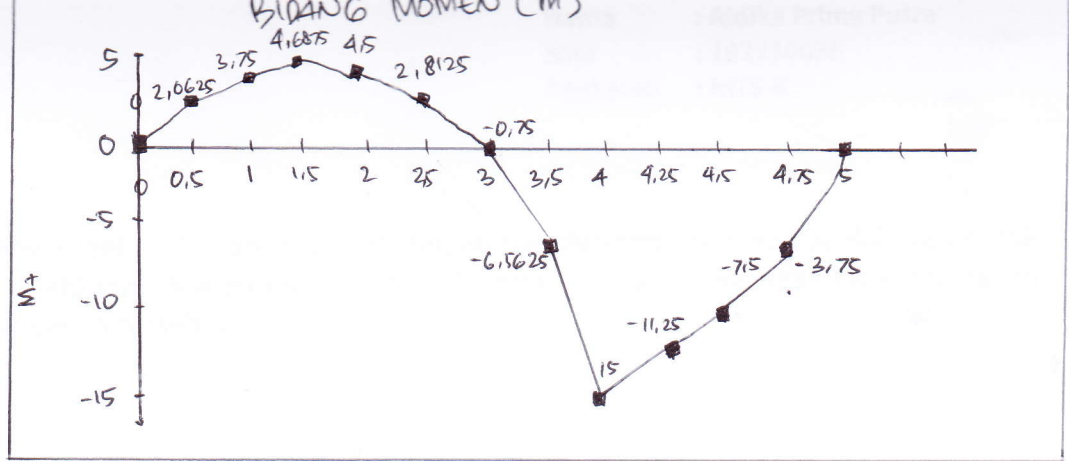
$$M_{x1} = V_A \cdot x_1 - Q_{x1} \cdot \frac{1}{3} x_1 \rightarrow M_{x1} = 4,25 \text{ kN} \cdot x_1 - 1,5 x_1^2 \frac{\text{kN}}{\text{m}^2} \cdot \frac{1}{3} x_1$$

$x_1 (m)$	0	0,5	1	1,5	2	2,5	3	3,5	4
M_{x1} (kN.m)	0	2,0625	3,75	4,6875	4,5	2,8125	-0,75	-6,5625	-15

Batang BC : $0 \leq x_2 \leq 1m$ diukur dari titik C

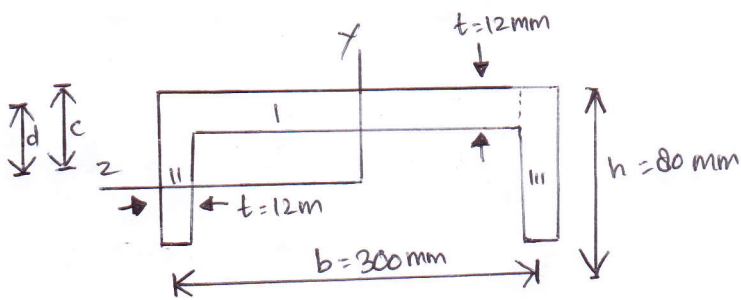
$$M_{x2} = -P \cdot x_2 = -15 \text{ kN} \cdot x_2$$

$x_2 (m)$	0	0,5	1
M_{x2} (kN.m)	0	-7,5	-15



Berdasarkan perhitungan diatas dapat disimpulkan bahwa momen positif maksimum dan negatif maksimum masing-masing adalah $4,6875 \text{ kN}\cdot\text{m}$ dan $-15 \text{ kN}\cdot\text{m}$.

Perhitungan Momen Inersia



Dari Sisi Atas Kiri :

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$$I_{z1} = \frac{1}{12} 276 \cdot 12^3 + 3312 \cdot 12,48^2 = 555589,3 \text{ mm}^4$$

$$I_{z2} = I_{z3} = \frac{1}{12} t \cdot h^3 \rightarrow I_{z2} = I_{z3} = \frac{1}{12} 12 \cdot 80^3 = 512000 \text{ mm}^4$$

$$I_z = I_{z1} + I_{z2} + I_{z3} = 1579589,3 \text{ mm}^4$$

Tegangan Tarik dan Tegangan Maksimum

$$\text{Tegangan tarik maksimum} = \sigma_t = \frac{M \cdot c}{I} = \frac{4,6875 \cdot 10^6 \text{ N}\cdot\text{mm} \cdot 18,48 \text{ mm}}{1579589,3 \text{ mm}^4} = 54,84 \text{ MPa}$$

$$\text{Tegangan tekan maksimum} = \sigma_c = \frac{M \cdot c}{I} = \frac{-15 \cdot 10^6 \text{ N}\cdot\text{mm} \cdot 18,48 \text{ mm}}{1579589,3 \text{ mm}^4} = -175,49 \text{ MPa}$$