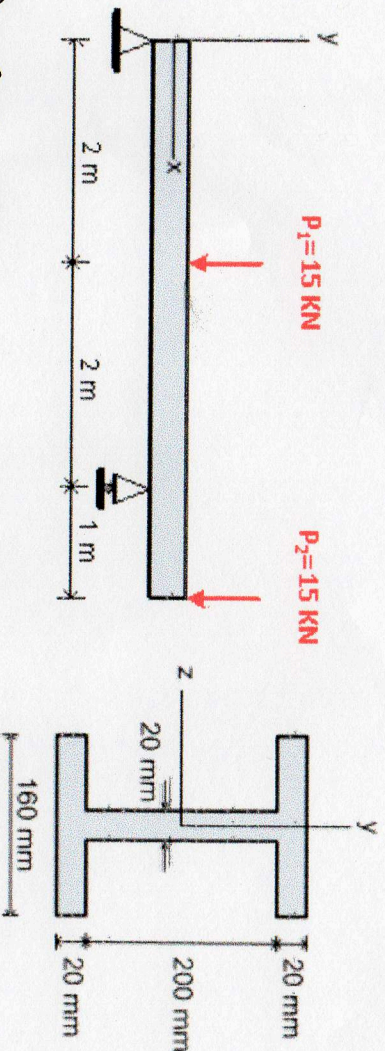


Upload Tugas ke-9

Tugas pertemuan ke-9

Sebuah balok dengan beban P_1 dan P_2 seperti tergambar. Penampang balok adalah profil IWF dengan $b = 160 \text{ mm}$ dan $h = 240 \text{ mm}$. Hitunglah tegangan tarik dan tekan maksimum akibat beban tersebut.



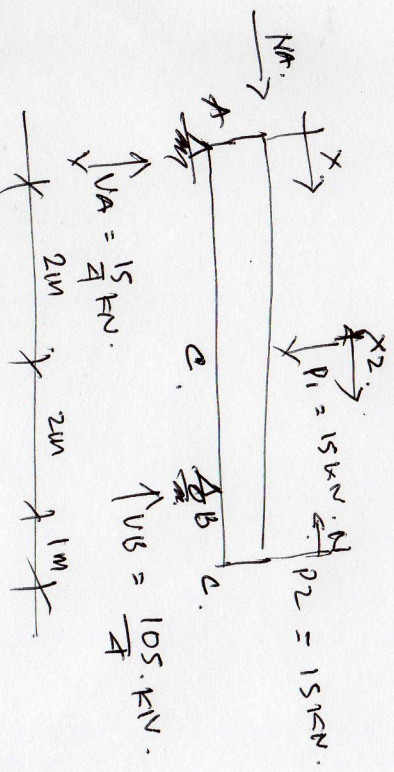
ditanya soal :

Startat ke selangkaan.

$$\sum M = 0$$

$$\sum V = 0$$

$$\sum H = 0$$



Peaksi

reaktikan di titik A dan B.

$$\sum M_A = 0.$$

$$-V_B \cdot 4 + P_2 \cdot 5 + P_1 \cdot 2 + H_A \cdot 0 = 0.$$

$$-V_B \cdot 4 + 15 \cdot 5 + 15 \cdot 2 = 0$$

$$-V_B \cdot 4 + 75 + 30 = 0.$$

$$+V_B = \frac{105}{4} \text{ kN}.$$

$$\sum V = 0.$$

$$V_A + V_B - P_1 - P_2 = 0$$

$$\frac{15}{4} + \frac{105}{4} - 15 - 15 = 0.$$

$$= \frac{120}{4} - 30 = 0.$$

$$30 - 30 = 0.$$

$$0 = 0 = 0.$$

$$\sum M_B = 0.$$

$$+V_A \cdot 4 - P_1 \cdot 2 + P_2 \cdot 1 = 0.$$

$$+V_A \cdot 4 - 15 \cdot 2 + 15 \cdot 1 = 0.$$

$$+V_A \cdot 4 - 30 + 15 = 0.$$

$$+V_A = \frac{15}{4} \text{ kN}.$$

Nama : Firman Nurrahman.
 NIM : 192710042
 Tugas : 9. (sementara) hal 2.

$$\sum H_A = 0.$$

$$H_A < 0 = 0$$

$$H_A = 0 \text{ (} \rightarrow \text{)}$$

Penghitungan Bidang Momen (M_A).

Tinjau Batang AC ($0 \leq x_1 \leq 2 \text{ m}$).

$$M_{x1} = 4 H_A \cdot x_1$$

$$M_{x1} = \frac{15}{4} x_1.$$

$x_1 \text{ (m)}$	0	0.5	1.5	2
$M_{x1} \text{ (kN.m)}$	0	-1.975	5.625	7.5

Tinjau Batang CB ($0 \leq x_2 \leq 2 \text{ m}$).

$$M_{x2} = V_A (2 + x_2 - x_1) - P_1 \cdot P_2.$$

$$= V_A \cdot (2 + x_2 - 15 \times N \cdot x_2)$$

$$= + \frac{15}{4} \text{ kN } (2 + x_2) - 15 \text{ k} \cdot x_2^2$$

$x_2 \text{ (m)}$	0	0.5	1	1.5	2
$M_{x2} \text{ (kN.m)}$	+7.5	+1.875	-3.75	-9.375	-15

Tinjau Batang DB ($0 \leq x_3 \leq 1$).

$$M_{x3} = -P_2$$

$$M_{x3} = -15 \text{ kN} \cdot x_3.$$

$x_3 \text{ (m)}$	0	0.5	1
$M_{x3} \text{ (kN.m)}$	0	-7.5	-15

Momen Maximal di titik B.

$$= -15 \text{ kN.m}.$$

⇒ tahanan terhadap beban terpusat

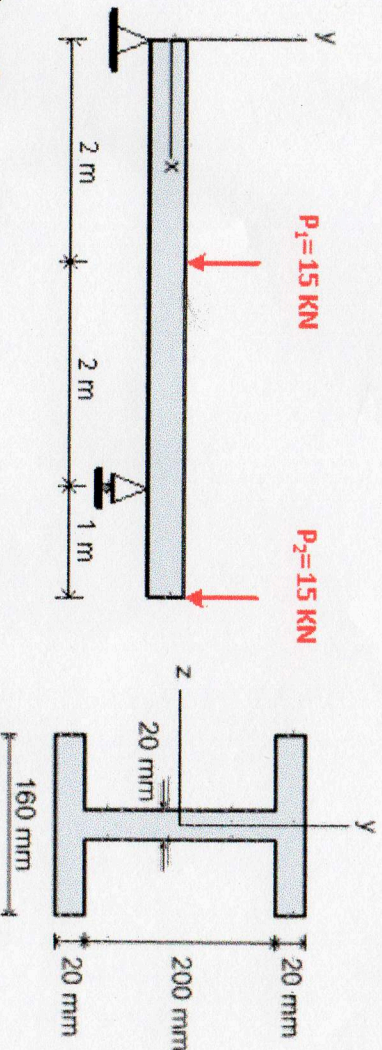
pada titik C dengan nilai momen (M_C) = +7.5 kN.m

distribusi beban terpusat (P_1).

⇒ tahanan pada P_2 pada titik D (M_D) = 0.

Tugas pertemuan ke-9

Sebuah balok dengan beban P_1 dan P_2 seperti tergambar. Penampang balok adalah profil iWF dengan $b = 160 \text{ mm}$ dan $h = 240 \text{ mm}$. Hitunglah tegangan tarik dan tekan maksimum akibat beban tersebut.



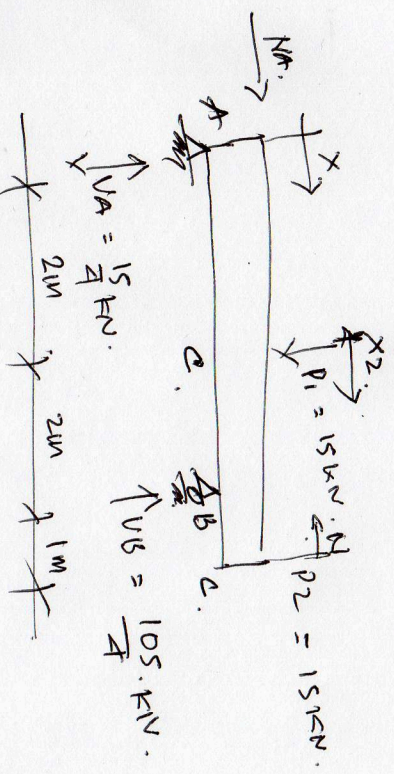
ditanya soal :

syarat ke seluasannya.

$$\sum M = 0$$

$$\sum V = 0$$

$$\sum H = 0$$



Reaksi:

kelestakan di titik A dan B.

$$\sum M_A = 0.$$

$$-V_B \cdot 4 + P_2 \cdot 5 + P_1 \cdot 2 + H_A \cdot 0 = 0.$$

$$-V_B \cdot 4 + 15 \cdot 5 + 15 \cdot 2 = 0$$

$$-V_B \cdot 4 + 75 + 30 = 0.$$

$$+V_B = \frac{105}{4} \text{ kN}.$$

$$\sum V = 0.$$

$$V_A + V_B - P_1 - P_2 = 0$$

$$\frac{15}{4} + \frac{105}{4} - 15 - 15 = 0.$$

$$= \frac{120}{4} - 30 = 0.$$

$$30 - 30 = 0.$$

$$0 = 0 = 0.$$

$$\sum M_B = 0.$$

$$+V_A \cdot 4 - P_1 \cdot 2 + P_2 \cdot 1 = 0.$$

$$+V_A \cdot 4 - 15 \cdot 2 + 15 \cdot 1 = 0.$$

$$+V_A \cdot 4 - 30 + 15 = 0.$$

$$+V_A = \frac{15}{4} \text{ kN}.$$

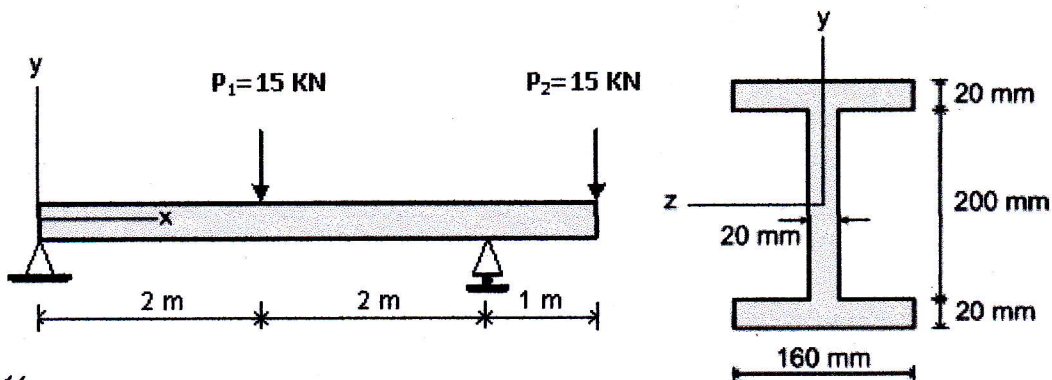
NAMA : Rahman Sahri

NIM : 192710044

TUGAS : 9. (1)

Tugas pertemuan ke-9

Sebuah balok dengan beban P_1 dan P_2 seperti tergambar. Penampang balok adalah profil IWF dengan $b = 160 \text{ mm}$ dan $h = 240 \text{ mm}$. Hitunglah tegangan tarik dan tekan maksimum akibat beban tersebut.



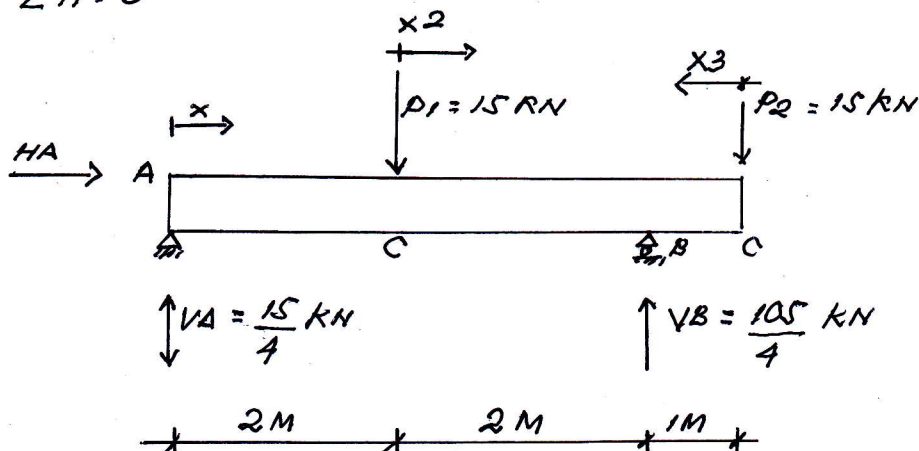
PENGESAIAN

SYARAT KESEIMBANGAN

$$\sum M = 0$$

$$\sum V = 0$$

$$\sum H = 0$$



Reaksi perantara di titik A dan B

$$\sum M_A = 0$$

$$-V_B \cdot 4 + P_2 \cdot 5 + P_1 \cdot 2 + H_A \cdot 0 = 0$$

$$-V_B \cdot 4 + 15 \cdot 5 + 15 \cdot 2 = 0$$

$$-V_B \cdot 4 + 75 + 30 = 0$$

$$+V_B = \frac{105}{4} \text{ kN}$$

$$\sum V = 0$$

$$V_A + V_B - P_1 - P_2 = 0$$

$$\frac{15}{4} + \frac{105}{4} - 15 - 15 = 0$$

$$= \frac{120}{4} - 30 = 0$$

$$\sum M_B = 0$$

$$+V_A \cdot 4 - P_1 \cdot 2 + P_2 \cdot 1 = 0$$

$$+V_A \cdot 4 - 15 \cdot 2 + 15 \cdot 1 = 0$$

$$+V_A \cdot 4 + 30 - 15 = 0$$

$$+V_A = \frac{15}{4} \text{ kN}$$

NAMA : Rahman Sahri

NIM : 192710044.

TUGAS : 9 (2) Sambungan.

$$\Sigma H_A = 0$$

$$H_A - 0 = 0$$

$$H_A = 0 (\rightarrow)$$

PERHITUNGAN BIDANG MOMEN (MR)

TINJAU BATANG AC ($0 \leq x_1 \leq 2\text{M}$)

$$M_{x1} = \frac{1}{4} V_A \cdot x_1$$

$$M_{x1} = \frac{15}{4} x_1$$

$x_1 \text{ (M)}$	0	0,5	1	1,5	2
$M_{x1} \text{ (KN-M)}$	0	+1,975	+3,75	+5,625	+7,5

TINJAU BATANG CB ($0 \leq x_2 \leq 2\text{M}$)

$$M_{x2} = V_A \cdot (x_1 + x_2) - P_1 \cdot P_2$$

$$= V_A \cdot (2 + x_2) - 15 \text{ KN} \cdot x_2$$

$$= + \frac{15}{4} \text{ KN} (2 + x_2) - 15 \text{ K} \cdot x_2$$

$x_2 \text{ (M)}$	0	0,5	1	1,5	2
$M_{x2} \text{ (KN-M)}$	+7,5	+1,875	-3,75	-9,375	-15

TINJAU BATANG DB ($0 \leq x_3 \leq 1$)

$$M_{x3} = -P_2$$

$$M_{x3} = -15 \text{ KN} \cdot x_3$$

$x_3 \text{ (M)}$	0	0,5	1
$M_{x3} \text{ (KN-M)}$	0	-7,5	-15

MOMEN MAXSIMAL di titik B

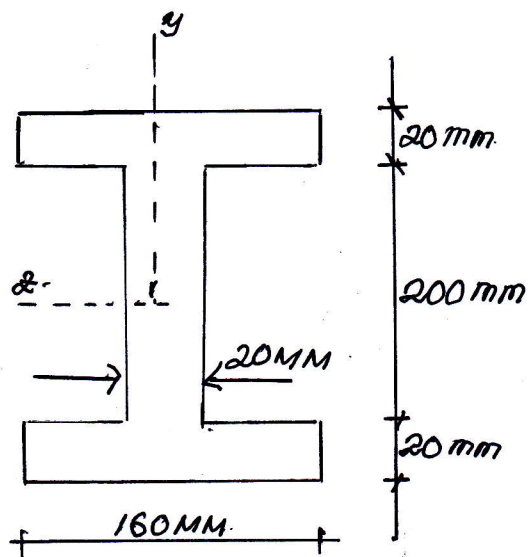
$$= -15 \text{ KN M.}$$

NAMA : Rahman Sahri
 NIM : 192710044
 TUGAS : 9 (3) Salingan.

→ Tekanan akibat beban terpusat
 pada titik C dengan nilai momen (M_C) = +7,5 kNm.
 Di akibatkan beban terpusat (P_1)

→ Tekanan pada P_2 pada titik D (M_D) = 0

PERHITUNGAN TEGANGAN TARIK DAN TEKAN MAXIMUM.

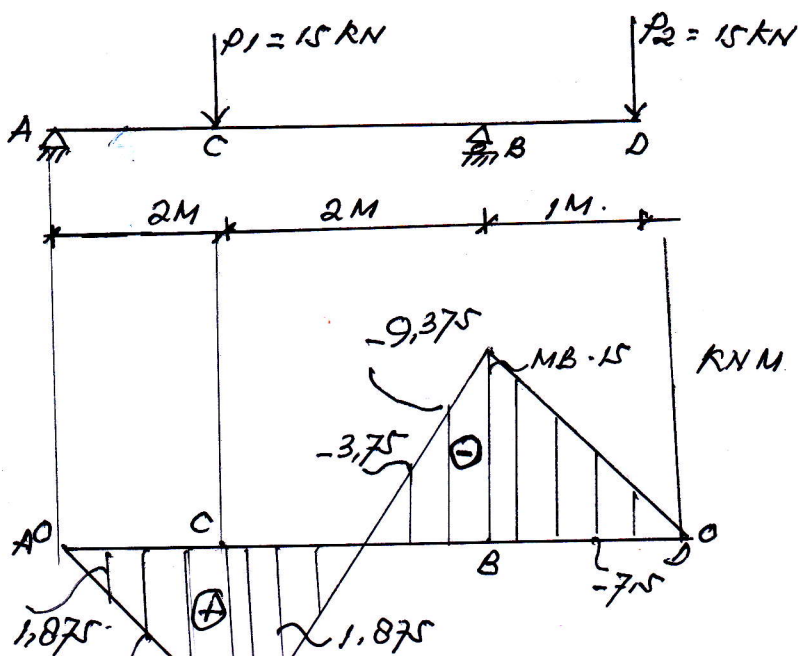


Jadi momen tarik (+) MAXIMUM pada titik C

$$M_C = 7,5 \text{ kN-m}$$

Momen tekan (-) MAXIMUM pada titik B

$$M_B = -15 \text{ kN-m}$$



TUGAS-9

MEKANIKA TERAPAN (MTS 271201)



Oleh :

Nama : Saeman

NIM : 192710038

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

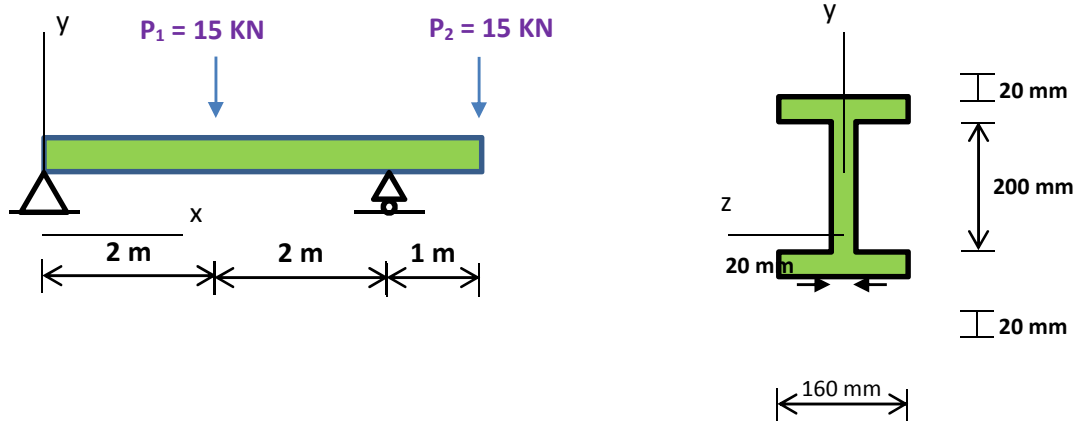
PROGRAM PASCASARJANA MAGISTER TEKNIK SIPIL

UNIVERSITAS BINA DARMA

2020

Tugas-9

Sebuah balok dengan beban P_1 dan P_2 seperti tergambar. Penampang balok adalah profil IWF dengan $b = 160 \text{ mm}$ dan $h = 240 \text{ mm}$. Hitunglah tegangan tarik dan tekan maksimum akibat beban tersebut.

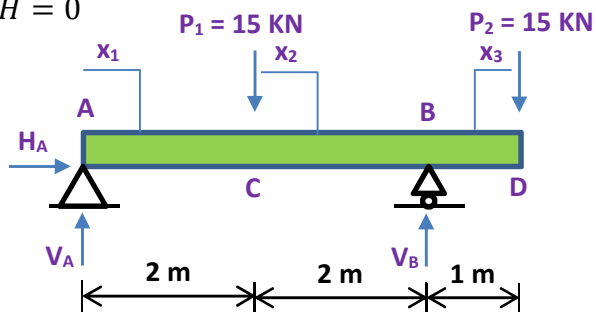


Jawab :

$$\sum M = 0$$

$$\sum V = 0$$

$$\sum H = 0$$



$$\sum M_A = 0$$

$$P_1 \cdot 2 \text{ m} - V_B \cdot 4 \text{ m} + P_2 \cdot 5 \text{ m} = 0 \rightarrow 15 \text{ kN} \cdot 2 \text{ m} - V_B \cdot 4 \text{ m} + 15 \text{ kN} \cdot 5 \text{ m} = 0$$

$$V_B \cdot 4 \text{ m} = 15 \text{ kN} \cdot 2 \text{ m} + 15 \text{ kN} \cdot 5 \text{ m} \rightarrow V_B = \frac{30 \text{ kN} \cdot \text{m} + 75 \text{ kN} \cdot \text{m}}{4 \text{ m}} \rightarrow V_B = 26,25 \text{ kN}$$

$$\sum M_B = 0$$

$$V_A \cdot 4 \text{ m} - P_1 \cdot 2 \text{ m} + P_2 \cdot 1 \text{ m} = 0 \rightarrow V_A \cdot 4 \text{ m} - 15 \text{ kN} \cdot 2 \text{ m} + 15 \text{ kN} \cdot 1 \text{ m} = 0$$

$$V_A \cdot 4 \text{ m} = 15 \text{ kN} \cdot 2 \text{ m} - 15 \text{ kN} \cdot 1 \text{ m} \rightarrow V_A = \frac{30 \text{ kN} \cdot \text{m} - 15 \text{ kN} \cdot \text{m}}{4 \text{ m}} \rightarrow V_A = 3,75 \text{ kN}$$

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

$$V_A + V_B - 15 \text{ kN} - 15 \text{ kN} = 0 \rightarrow 3,75 \text{ kN} + 26,25 \text{ kN} - 15 \text{ kN} - 15 \text{ kN} = 0 \rightarrow 0 = 0 \text{ (ok)}$$

$$\sum H = 0$$

$$H_A = 0$$

❖ PERHITUNGAN BIDANG MOMEN (M_x)

Batang AC : $0 \leq x_1 \leq 2 \text{ m}$ diukur dari titik A

$$M_{x1} = V_A \cdot x_1 \rightarrow M_{x1} = 3,75 \text{ kN} \cdot x_1$$

$x_1 \text{ (m)}$	0	0,5	1	1,5	2
M_{x1} (kN.m)	0	1,875	3,75	5,625	7,5

Batang CB : $0 \leq x_2 \leq 2 \text{ m}$ diukur dari titik C

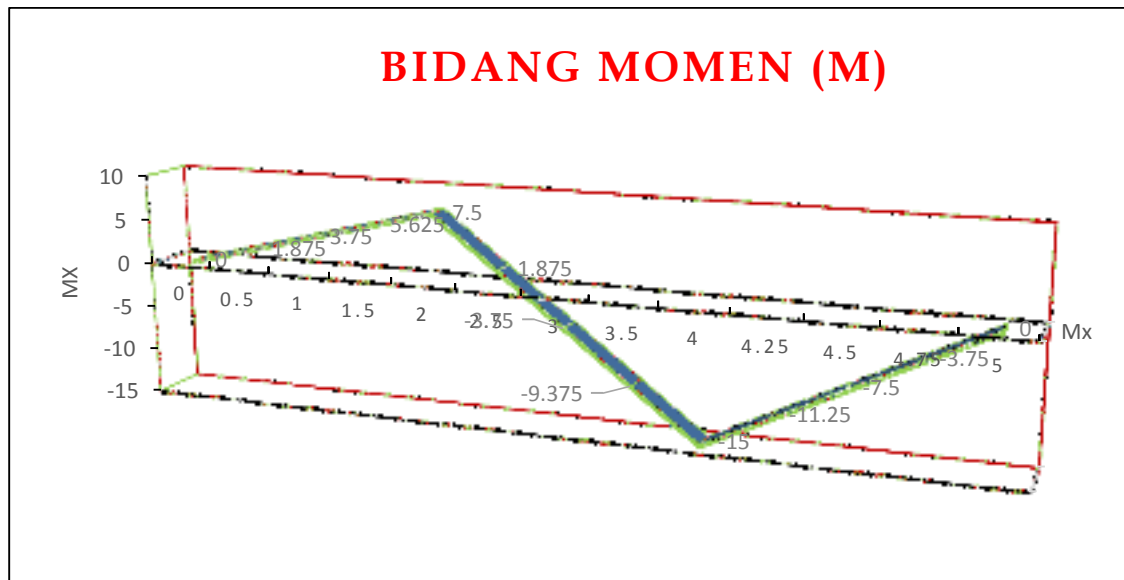
$$M_{x2} = -P_1 \cdot x_2 + V_A \cdot (x_2 + 2 \text{ m}) \rightarrow M_{x2} = -15 \text{ kN} \cdot x_2 + 3,75 \text{ kN} \cdot (x_2 + 2 \text{ m})$$

$x_2 \text{ (m)}$	0	0,5	1	1,5	2
M_{x2} (kN.m)	7,5	1,875	-3,75	-9,375	-15

Batang BD : $0 \leq x_3 \leq 1 \text{ m}$ diukur dari titik D

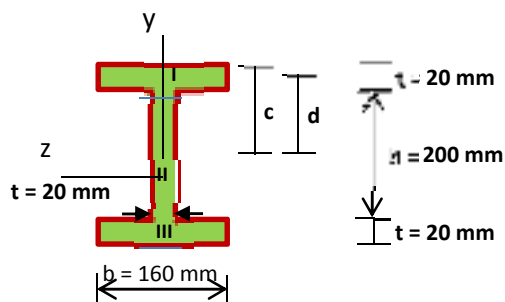
$$M_{x3} = -P_2 \cdot x_3 \rightarrow M_{x3} = -15 \text{ kN} \cdot x_3$$

$x_3 \text{ (m)}$	0	0,5	1	1,5	2
$M_{x3} \text{ (kN.m)}$	7,5	1,875	-3,75	-9,375	-15



Berdasarkan perhitungan di atas dapat disimpulkan bahwa momen positif maksimum dan negatif maksimum masing-masing adalah 7,5 kN.m dan -15 kN.m.

❖ PERHITUNGAN MOMEN INERSIA



$$c = \frac{20 + 200 + 20}{2} = 120 \text{ mm}$$

$$d = c - \frac{20}{2} = 120 \text{ mm} - \frac{20}{2} \text{ mm} = 110 \text{ mm}$$

$$A_1 = A_3 = b \cdot t = 160 \text{ mm} \cdot 20 \text{ mm} = 3200 \text{ mm}^2$$

$$A_2 = h \cdot t = 200 \text{ mm} \cdot 20 \text{ mm} = 4000 \text{ mm}^2$$

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

$$I_{z1} = I_{z3} = \frac{1}{12} 160 \cdot 20^3 + 3200 \cdot 110^2 = 38826667 \text{ mm}^4$$

$$I_{z2} = \frac{1}{12} t \cdot h^3 \rightarrow I_{z2} = \frac{1}{12} 20 \cdot 200^3 = 13333333 \text{ mm}^4$$

$$I_z = I_{z1} + I_{z2} + I_{z3} = 90986667 \text{ mm}^4$$

❖ TEGANGAN TARIK DAN TEKAN MAKSIMUM

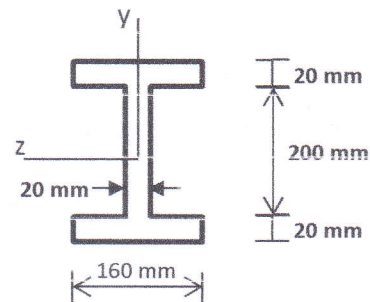
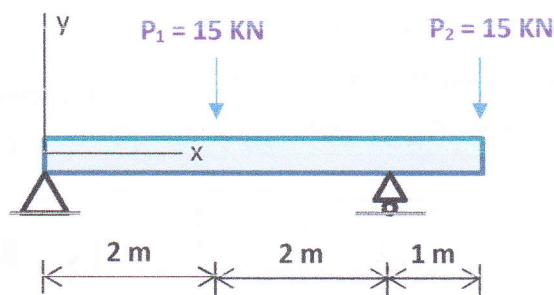
$$\text{Tegangan tarik maksimum : } \sigma_t = \frac{M \cdot c}{I} = \frac{7,5 \cdot 10^6 \text{ N} \cdot \text{mm} \cdot 110 \text{ mm}}{90986667 \text{ mm}^4} = 9,067 \text{ MPa}$$

$$\text{Tegangan tekan maksimum : } \sigma_c = \frac{M \cdot c}{I} = \frac{15 \cdot 10^6 \text{ N} \cdot \text{mm} \cdot 110 \text{ mm}}{90986667 \text{ mm}^4} = -18,135 \text{ MPa}$$

Nama Mahasiswa : Agus Rudiyanto/ 192710046/ MTS4
Mata Kuliah : MEKANIKA TERAPAN (MTS271201)
Dosen : Dr. Firdaus, M.T.
Tugas : EL. 09

TUGAS 9 :

Sebuah balok dengan beban P_1 dan P_2 seperti tergambar. Penampang balok adalah profil IWF dengan $b = 160$ mm dan $h = 240$ mm. Hitunglah tegangan tarik dan tekan maksimum akibat beban tersebut.

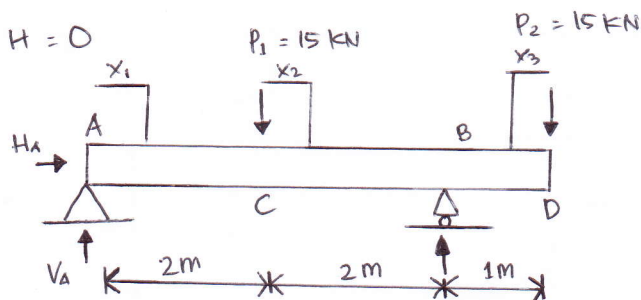


JAWAB :

$$\sum M = 0$$

$$\sum V = 0$$

$$\sum H = 0$$



$$\sum M_A = 0$$

$$P_1 \cdot 2m - V_B \cdot 4m + P_2 \cdot 5m = 0 \rightarrow 15 \text{ kN} \cdot 2m - V_B \cdot 4m + 15 \text{ kN} \cdot 5m = 0$$

$$V_B \cdot 4m = 15 \text{ kN} \cdot 2m + 15 \text{ kN} \cdot 5m \rightarrow V_B = \frac{30 \text{ kN} \cdot m + 75 \text{ kN} \cdot m}{4m} \rightarrow V_B = 26,25 \text{ kN}$$

$$\sum M_B = 0$$

$$V_A \cdot 4m - P_1 \cdot 2m + P_2 \cdot 1m = 0 \rightarrow V_A \cdot 4m - 15 \text{ kN} \cdot 2m + 15 \text{ kN} \cdot 1m = 0$$

$$V_A \cdot 4m = 15 \text{ kN} \cdot 2m - 15 \text{ kN} \cdot 1m \rightarrow V_A = \frac{30 \text{ kN} \cdot m - 15 \text{ kN} \cdot m}{4m} \rightarrow V_A = 3,75 \text{ kN}$$

Kontrol : $\sum V = 0$

$$V_A + V_B - 15 \text{ kN} - 15 \text{ kN} = 0 \rightarrow 3,75 \text{ kN} + 26,25 \text{ kN} - 15 \text{ kN} - 15 \text{ kN} = 0 \rightarrow 0 = 0 \text{ (OK)}$$

$$\sum H = 0$$

$$H_A = 0$$

Perhitungan Bidang Momen (M_x)

Batang AC : $0 \leq x_1 \leq 2 \text{ m}$ diukur dari titik A

$$M_{x1} = V_A \cdot x_1 \rightarrow M_{x1} = 3,75 \text{ kN} \cdot x_1$$

$x_1 (\text{m})$	0	0,5	1	1,5	2
$M_{x1} (\text{kNm})$	0	1,875	3,75	5,625	7,5

Batang CB : $0 \leq x_2 \leq 2 \text{ m}$ diukur dari titik C

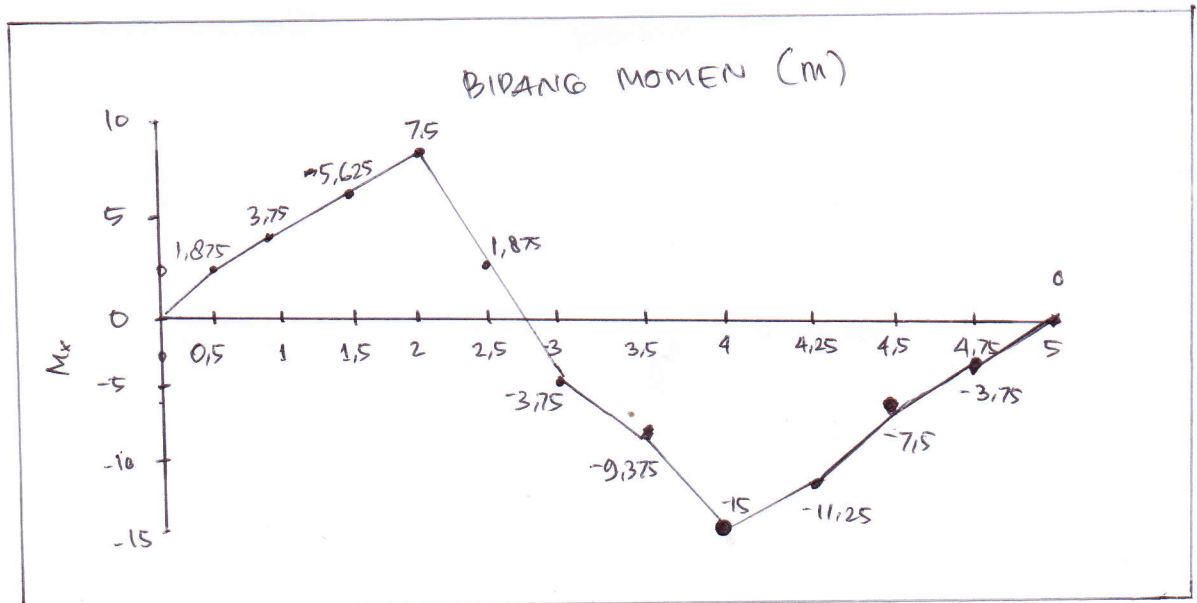
$$M_{x2} = -P_1 \cdot x_2 + V_A \cdot (x_2 + 2 \text{ m}) \rightarrow M_{x2} = -15 \text{ kN} \cdot x_2 + 3,75 \text{ kN} \cdot (x_2 + 2 \text{ m})$$

$x_2 (\text{m})$	0	0,5	1	1,5	2
$M_{x2} (\text{kNm})$	7,5	1,875	-3,75	-9,375	-15

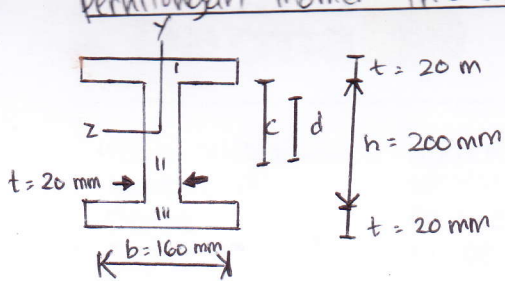
Batang BD : $0 \leq x_3 \leq 1 \text{ m}$ diukur dari titik D

$$M_{x3} = -P_2 \cdot x_3 \rightarrow M_{x3} = -15 \text{ kN} \cdot x_3$$

$x_3 (\text{m})$	0	0,5	1	1,5	2
$M_{x3} (\text{kNm})$	7,5	1,875	-3,75	-9,375	-15



Berdasarkan perhitungan di atas dapat disimpulkan bahwa momen positif maksimum dan negatif maksimum masing-masing adalah $7,5 \text{ kN} \cdot \text{m}$ dan $-15 \text{ kN} \cdot \text{m}$.



$$c = \frac{20 + 200 + 20}{2} = 120 \text{ mm}$$

$$d = c - \frac{20}{2} = 120 \text{ mm} - \frac{20}{2} \text{ mm} = 110 \text{ mm}$$

$$A_1 = A_3 = b \cdot t = 160 \text{ mm} \cdot 20 \text{ mm} = 3200 \text{ mm}^2$$

$$A_2 = h \cdot t = 200 \text{ mm} \cdot 20 \text{ mm} = 4000 \text{ mm}^2$$

$$I_{21} = I_{2c} + A_1 \cdot d^2 \rightarrow I_{21} = \frac{1}{12} b t^3 + A_1 \cdot d^2$$

$$I_{21} = I_{23} = \frac{1}{12} 160 \cdot 20^3 + 3200 \cdot 110^2 = 38826667 \text{ mm}^4$$

$$I_{22} = \frac{1}{12} t \cdot h^3 \rightarrow I_{22} = \frac{1}{12} 20 \cdot 200^3 = 13333333 \text{ mm}^4$$

$$I_2 = I_{21} + I_{22} + I_{23} = 90986667 \text{ mm}^4$$

Tegangan Tarik dan Tekanan Maksimum

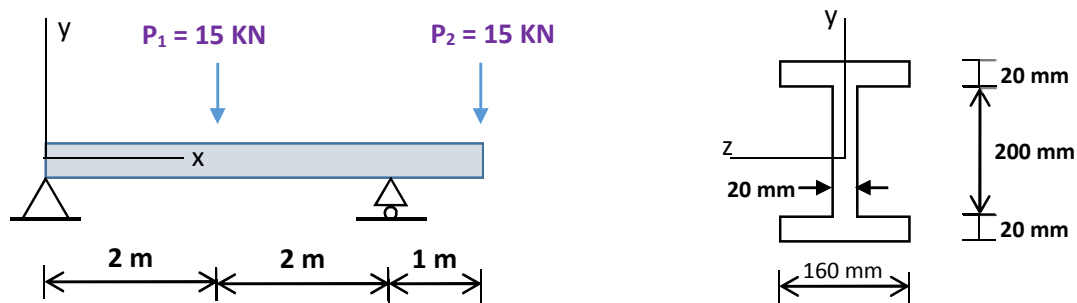
$$\text{Tegangan Tarik maksimum : } \sigma_t = \frac{M \cdot c}{I} = \frac{7,5 \cdot 10^6 \text{ N} \cdot \text{mm} \cdot 110 \text{ mm}}{90986667 \text{ mm}^4} = 9,067 \text{ MPa}$$

$$\sigma_c = \frac{M \cdot c}{I} = \frac{-15 \cdot 10^6 \text{ N} \cdot \text{mm} \cdot 110 \text{ mm}}{90986667 \text{ mm}^4} = -18,185 \text{ MPa}$$

NAMA : ANDI SUPRIYADI
NIM : 192710035
ANGKATAN : MTS-4

TUGAS : 9

Sebuah balok dengan beban P_1 dan P_2 seperti tergambar. Penampang balok adalah profil IWF dengan $b = 160 \text{ mm}$ dan $h = 240 \text{ mm}$. Hitunglah tegangan tarik dan tekan maksimum akibat beban tersebut.

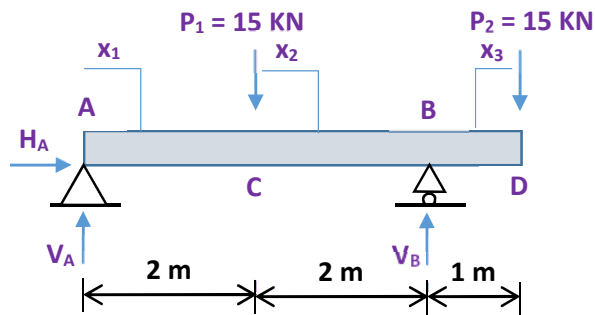


Jawab :

$$\sum M = 0$$

$$\sum V = 0$$

$$\sum H = 0$$



$$\sum M_A = 0$$

$$P_1 \cdot 2 \text{ m} - V_B \cdot 4 \text{ m} + P_2 \cdot 5 \text{ m} = 0 \rightarrow 15 \text{ kN} \cdot 2 \text{ m} - V_B \cdot 4 \text{ m} + 15 \text{ kN} \cdot 5 \text{ m} = 0$$

$$V_B \cdot 4 \text{ m} = 15 \text{ kN} \cdot 2 \text{ m} + 15 \text{ kN} \cdot 5 \text{ m} \rightarrow V_B = \frac{30 \text{ kN} \cdot \text{m} + 75 \text{ kN} \cdot \text{m}}{4 \text{ m}} \rightarrow V_B = 26,25 \text{ kN}$$

$$\sum M_B = 0$$

$$V_A \cdot 4 \text{ m} - P_1 \cdot 2 \text{ m} + P_2 \cdot 1 \text{ m} = 0 \rightarrow V_A \cdot 4 \text{ m} - 15 \text{ kN} \cdot 2 \text{ m} + 15 \text{ kN} \cdot 1 \text{ m} = 0$$

$$V_A \cdot 4 \text{ m} = 15 \text{ kN} \cdot 2 \text{ m} - 15 \text{ kN} \cdot 1 \text{ m} \rightarrow V_A = \frac{30 \text{ kN} \cdot \text{m} - 15 \text{ kN} \cdot \text{m}}{4 \text{ m}} \rightarrow V_A = 3,75 \text{ kN}$$

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

$$V_A + V_B - 15 \text{ kN} - 15 \text{ kN} = 0 \rightarrow 3,75 \text{ kN} + 26,25 \text{ kN} - 15 \text{ kN} - 15 \text{ kN} = 0 \rightarrow 0 = 0 \text{ (ok)}$$

$$\sum H = 0$$

$$H_A = 0$$

PERHITUNGAN BIDANG MOMEN (M_x)

Batang AC : $0 \leq x_1 \leq 2\text{ m}$ diukur dari titik A

$M_{x1} = V_A \cdot x_1 \rightarrow M_{x1} = 3,75\text{ kN} \cdot x_1$

$x_1\text{ (m)}$	0	0,5	1	1,5	2
$M_{x1}\text{ (kN.m)}$	0	1,875	3,75	5,625	7,5

Batang CB : $0 \leq x_2 \leq 2\text{ m}$ diukur dari titik C

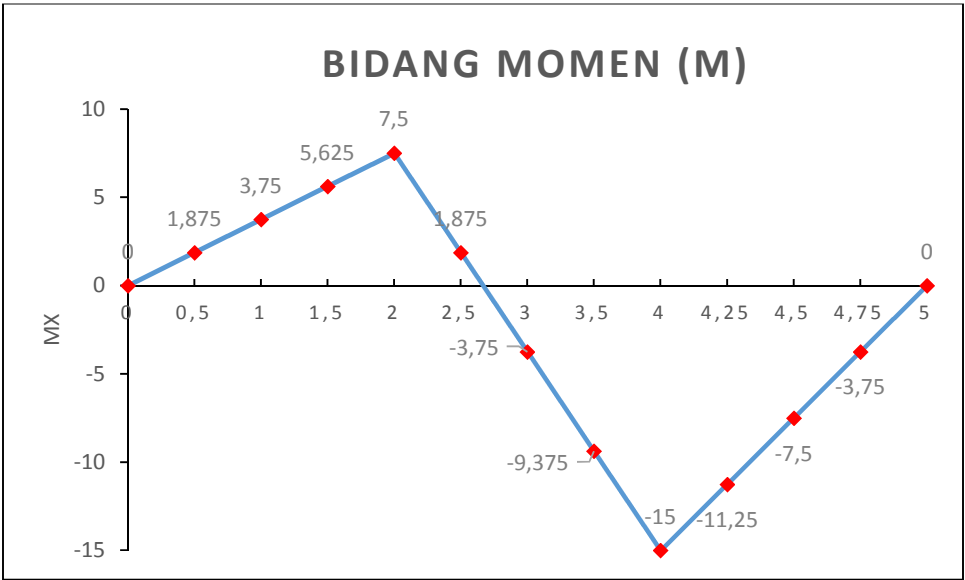
$M_{x2} = -P_1 \cdot x_2 + V_A \cdot (x_2 + 2\text{ m}) \rightarrow M_{x2} = -15\text{ kN} \cdot x_2 + 3,75\text{ kN} \cdot (x_2 + 2\text{ m})$

$x_2\text{ (m)}$	0	0,5	1	1,5	2
$M_{x2}\text{ (kN.m)}$	7,5	1,875	-3,75	-9,375	-15

Batang BD : $0 \leq x_3 \leq 1\text{ m}$ diukur dari titik D

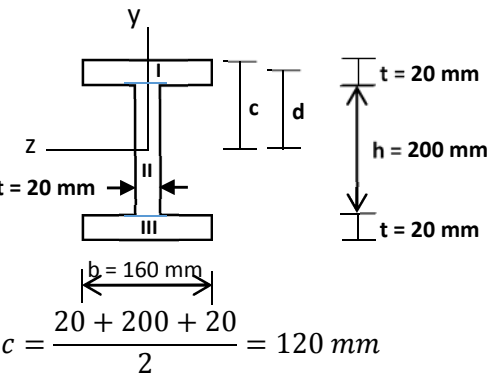
$M_{x3} = -P_2 \cdot x_3 \rightarrow M_{x3} = -15\text{ kN} \cdot x_3$

$x_3\text{ (m)}$	0	0,5	1	1,5	2
$M_{x3}\text{ (kN.m)}$	7,5	1,875	-3,75	-9,375	-15



Berdasarkan perhitungan di atas dapat disimpulkan bahwa momen positif maksimum dan negatif maksimum masing-masing adalah 7,5 kN.m dan -15 kN.m.

PERHITUNGAN MOMEN INERSIA



$$d = c - \frac{20}{2} = 120 \text{ mm} - \frac{20}{2} \text{ mm} = 110 \text{ mm}$$

$$A_1 = A_3 = b \cdot t = 160 \text{ mm} \cdot 20 \text{ mm} = 3200 \text{ mm}^2$$

$$A_2 = h \cdot t = 200 \text{ mm} \cdot 20 \text{ mm} = 4000 \text{ mm}^2$$

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

$$I_{z1} = I_{z3} = \frac{1}{12} 160 \cdot 20^3 + 3200 \cdot 110^2 = 38826667 \text{ mm}^4$$

$$I_{z2} = \frac{1}{12} t \cdot h^3 \rightarrow I_{z2} = \frac{1}{12} 20 \cdot 200^3 = 13333333 \text{ mm}^4$$

$$I_z = I_{z1} + I_{z2} + I_{z3} = 90986667 \text{ mm}^4$$

TEGANGAN TARIK DAN TEKAN MAKSIMUM

$$\text{Tegangan tarik maksimum : } \sigma_t = \frac{M \cdot c}{I} = \frac{7,5 \cdot 10^6 \text{ N} \cdot \text{mm} \cdot 110 \text{ mm}}{90986667 \text{ mm}^4} = 9,067 \text{ MPa}$$

$$\text{Tegangan tekan maksimum : } \sigma_c = \frac{M \cdot c}{I} = \frac{-15 \cdot 10^6 \text{ N} \cdot \text{mm} \cdot 110 \text{ mm}}{90986667 \text{ mm}^4} = -18,135 \text{ MPa}$$