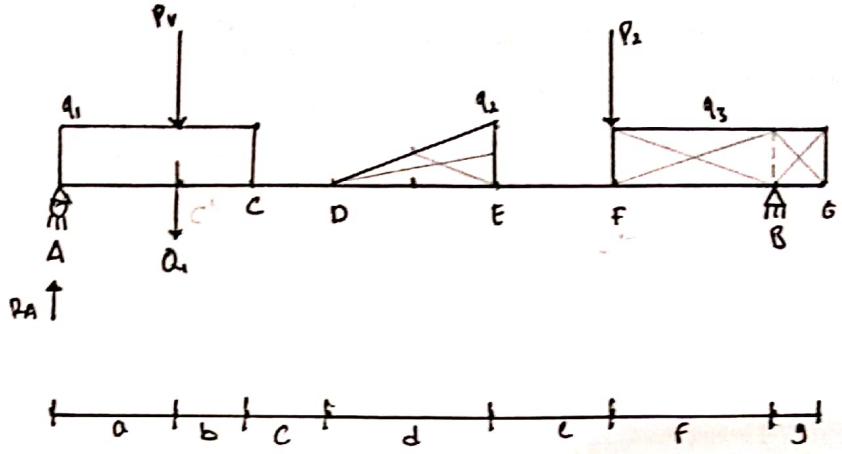
1. Diketahui struktur simple beam dengan beban seperti tergambar.



Dikt:

- a = 3m
- b = 1,8m
- c = 2m.
- d = 4m
- e = 3m
- f = 4m.
- g = 1m
- P_1 = 11 kN
- P_2 = 14 kN
- q_1 = 9 kN/m'
- q_2 = 9 kN/m'
- q_3 = 10 kN/m'
- θ = 33°

Pertanyaan:

a. Hitung dan gambarkan bidang momen, lintang, dan normal akibat beban tetap (seperti tergambar.

- $Q_1 = q_1 \cdot (a+b+c)$
  $= 9 \cdot (3+1,8)$
  $= 43,2$
  $= 43,2$ kN.
- $Q_2 = \frac{q_2 \cdot 4}{2}$
  $= \frac{9 \cdot 4}{2}$
  $= 18$ kN
- $Q_3 = q_3 \cdot 4$
  $= 10 \cdot 4$
  $= 40$ kN
- $Q_4 = q_3 \cdot 1$
  $= 10 \cdot 1$
  $= 10$ kN.
- $P_V = P_1 \cdot \sin 33°$
  $= 11 \cdot 0,4954$
  $= 5,9910$ kN
- $P_H = P_1 \cdot \cos 33°$
  $= 11 \cdot 0,8686$
  $= 9,5546$ kN.

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-Reaksi Peletakan

⇒ $\Sigma M_B = 0$

$R_A \cdot L - (Q_1 a(\frac{1}{2}a) + c + d + e + f) - (P_V(b+c+d+e+f)) - (Q_1 b(\frac{1}{2}b) + c + d + e + f) - (Q_2(\frac{1}{3}d) + e + f) - (P_2 \cdot f) - (Q_3 \cdot (\frac{1}{2}f)) + (Q_4 \cdot (\frac{1}{2} \cdot g)) = 0$

$R_A \cdot 17{,}8 - [27(1{,}5) + 2 + 4 + 3 + 4) - (5{,}9910(1{,}8 + 2 + 4 + 3 + 4)) - (16{,}2(0{,}9) + 2 + 4 + 3 + 4) - (18(1{,}3333) + 3 + 4) - (14 \cdot 4) - (40 \cdot 2) + (10 \cdot 0{,}5) = 0$

$R_A \cdot 17{,}8 - 440{,}1 - 88{,}6668 - 225{,}18 - 149{,}9994 - 156 - 80 + 5 = 0$

$R_A \cdot 17{,}8 - 1034{,}9462 = 0$

$R_A \cdot 17{,}8 = 1034{,}9462$

$R_A = \frac{1034{,}9462}{17{,}8} = 58{,}1430 \text{ kN } (\uparrow)$

⇒ $\Sigma M_A = 0$

$-R_B \cdot L + (Q_3(\frac{1}{2}f) + e + d + c + b + a) + (P_2(e+d+c+b+a)) + (Q_2(\frac{1}{3}d) + c + b + a) + (Q_1 b(\frac{1}{2}b) + a) + (P_V \cdot a) + (Q_1 a(\frac{1}{2}a)) + (Q_4 \cdot (\frac{1}{2}g) + f + e + d + c + b + a) = 0$

$-R_B \cdot 17{,}8 + (40(2) + 3 + 4 + 2 + 1{,}8 + 3) + (14(3 + 4 + 2 + 1{,}8 + 3)) + (18(2{,}6667) + 2 + 1{,}8 + 3) + (16{,}2((0{,}9) + 3)) + (5{,}9910 \cdot 3) + (27(1{,}5)) + (10((0{,}5) + 4 + 3 + 4 + 2 + 1{,}8 + 3)) = 0$

$-R_B \cdot 17{,}8 + 632 + 193{,}2 + 170{,}4006 + 63{,}18 + 17{,}9730 + 40{,}5 + 183 = 0$

$-R_B \cdot 17{,}8 + 1300{,}2536 = 0$

$R_B \cdot 17{,}8 = 1300{,}2536$

$R_B = \frac{1300{,}2536}{17{,}8}$

$R_B = 73{,}0480 \text{ kN. } (\uparrow)$

⇒ Checking

$\Sigma V = 0$

$R_A + R_B = Q_1 a + P_V + Q_1 b + Q_2 + P_2 + Q_3 + Q_4$

$58{,}1430 + 73{,}0480 = 27 + 5{,}9910 + 16{,}2 + 18 + 14 + 40 + 10.$

$131{,}1910 \text{ kN} = 131{,}1910 \text{ kN}$

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- Gaya Lintang (D)

1). $D_A = R_{AV} = 58,1430$

2). $D_{C'} = R_{AV} - q_1 \cdot a$
$= 58,1430 - (9 \cdot 3)$
$= 31,1430$

3). $D_{C' \text{ kanan}} = D_{C'} - P_1V$
$= R_{AV} - q_1 \cdot a - P_1V$
$= 31,1430 - 5,9910$
$= 25,1520$

4). $D_C = R_{AV} - Q_1 - P_1V$
$= 58,1430 - 43,2 - 5,9910$
$= 8,9520$

5). $D_D = D_C = R_{AV} - Q_1 - P_1V$
$= 8,9520$

6). $D_E = D_D - Q_2$
$= R_{AV} - Q_1 - P_1V - Q_2$
$= 58,1430 - 43,2 - 5,9910 - 18$
$= -9,0480$

7). $D_F = D_E$
$= R_{AV} - Q_1 - P_1V - Q_2$
$= 58,1430 - 43,2 - 5,9910 - 18$
$= -9,0480$

8). $D_{F \text{ kanan}} = D_{F \text{ kiri}} - P_2$
$= R_{AV} - Q_1 - P_1V - Q_2 - P_2$
$= 58,1430 - 43,2 - 5,9910 - 18 - 14$
$= -23,0480$

9). $D_{B \text{ kiri}} = D_{F \text{ kanan}} - Q_3$
$= R_{AV} - Q_1 - P_1V - Q_2 - P_2 - Q_3$
$= 58,1430 - 43,2 - 5,9910 - 18 - 14 - 40$
$= -63,0480$

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10). DB kanan = DB kiri + RBV

= RAV - Q_1 - P_1V - Q_2 - P_2 - Q_3 + RBV

= 58,1480 - 43,2 - 5,9910 - 18 - 14 - 40 + 73,0480

= 10

11). DG = DB kanan - Q_4

= RAV - Q_1 - P_1V - Q_2 - P_2 - Q_3 + RBV - Q_4

= 58,1480 - 43,2 - 5,9910 - 18 - 14 - 40 + 73,0480 - 10

= 10 - 10

= 0.

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- Bidang Momen (M)

1). $M_A = 0$ kNm

2). $M_C = R_{AV}(a) - q_1 \cdot a \cdot 1/2 a$

$= 58,1430(3) - 9.(3).1/2.(3)$

$= 174,429 - 40,5$

$= 133,929$ kNm.

3). $M_C = R_{AV}(a+b) - Q_1\left(\frac{a+b}{2}\right) - P_1V(b)$

$= 58,1430(4,8) - 43,2(2,4) - 5,9910(1,8).$

$= 164,6226$ kNm

4). $M_D = R_{AV}(a+b+c) - Q_1\left(\left(\frac{a+b}{2}\right)+c\right) - P_1V(b+c).$

$= 58,1430(6,8) - 43,2(4,4) - 5,9910(3,8).$

$= 182,5266.$ kNm

5). $M_E = R_{AV}(a+b+c+d) - Q_1\left(\left(\frac{a+b}{2}\right)+c+d\right) - P_1V(b+c+d) - Q_2(1/3\,d).$

$= 58,1430(10,8) - 43,2(8,4) - 5,9910(7,8) - 18(1,8333).$

$= 194,3406$ kNm.

6). $M_F = R_{AV}(a+b+c+d+e) - Q_1\left(\left(\frac{a+b}{2}\right)+c+d+e\right) - P_1V(b+c+d+e) - Q_2(1/3d+e)$

$= 58,1430(13,8) - 43,2(11,4) - 5,9910(10,8) - 18(4,3333).$

$= 167,1966$ kNm

7). $M_B = R_{AV}(\Sigma af) - Q_1\left(\left(\frac{a+b}{2}\right)+\Sigma cf\right) - P_1V(\Sigma bf) - Q_2(1/3\,d+\Sigma ef) -$

$P_2(f) - Q_3(1/2\,f).$

$= 58,1430(17,8) - 43,2(15,4) - 5,9910(14,8) - 18(8,3333) -$

$14(9) - 40(2).$

$= -4,9954$ kNm.

8). $M_G = R_{AV}(\Sigma ag) - Q_1\left(\left(\frac{a+b}{2}\right)+\Sigma cg\right) - P_1V(\Sigma bg) - Q_2(1/3\,d+\Sigma eg) -$

$P_2(fg) - Q_3(1/2\,f+g) - Q_4(1/2\,g) + R_{BV}(g).$

$= 58,1430(18,8) - 43,2(16,4) - 5,9910(15,8) - 18(9,3333) -$

$14(5) - 40(3) - 10(0,5) + 73,0480$

$= -0,00008$ kNm $= 0$ kNm.

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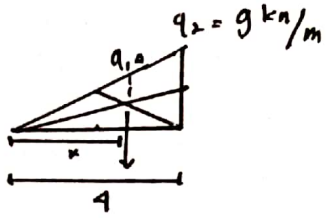
- Momen Maximum.



• Perbandingan Δ Besar dengan Δ kecil.

$$\frac{q_2}{q_1} = \frac{4}{x}$$

$$q_{1a} = \frac{9x}{4}$$

$M_{max} = R_{AV}(a+b+c+x) - q_1\left(\left(\frac{a+b}{2}\right)+c+x\right) - P_1V(b+c+x) - \left(\frac{1}{2}\cdot q_{1a}\cdot x\right)\left(\frac{1}{3}x\right)$

$= 58,1430(3+1,8+2+x) - 43,12\left(\frac{3+1,8}{2}+2+x\right) - 5,9910(1,8+2+x) - \left(\frac{1}{2}\cdot\left(\frac{9x}{4}\right)\cdot x\right)\left(\frac{1}{3}x\right)$

$= 395,3724 + 58,1430x - 190,08 - 43,12x - 22,7658 - 5,9910x - \left(\frac{9x^3}{24}\right)$

$= 182,5266 + 8,952x - 0,375x^3$

$M_{max} = -0,375x^3 + 8,952x + 182,5266.$

$$\frac{dm}{dx} = \frac{d}{dx}\left(-0,375x^3 + 8,952x + 182,5266\right.$$

$$= -1,125x^2 + 8,952$$

$$-1,125x^2 + 8,952 = 0$$

$$8,952 = 1,125x^2$$

$$x^2 = \frac{8,952}{1,125}$$

$$x^2 = 7,9573$$

$$x = \sqrt{7,9573}$$

$$x = 2,8208.$$

$M_{max} = -0,375x^3 + 8,952x + 182,5266$

$= -0,375(2,8208)^3 + 8,952(2,8208) + 182,5266.$

$= -0,375(22,4448) + 25,2518 + 182,5266$

$= -8,4188 + 207,7784$

$= 199,3596$ kNm.

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- Bidang Normal (N)

$\Sigma H = 0$

$N_A - P_i H = 0$

$N_A = P_i H$

$N_A = 9{,}5546$

$N_H = N_A - P_i H$

$= 9{,}5546 - 9{,}5546$

$= 0$ kN.

$N_C = N_H = 0$ kN

$N_D = N_H = 0$ kN

$N_E = N_H = 0$ kN

$N_F = N_H = 0$ kN

$N_B = N_H = 0$ kN

$N_E = N_H = 0$ kN

Gaya Normal Positif, artinya gaya yang arahnya masuk dari titik kumpul, disebut juga gaya normal tarik..

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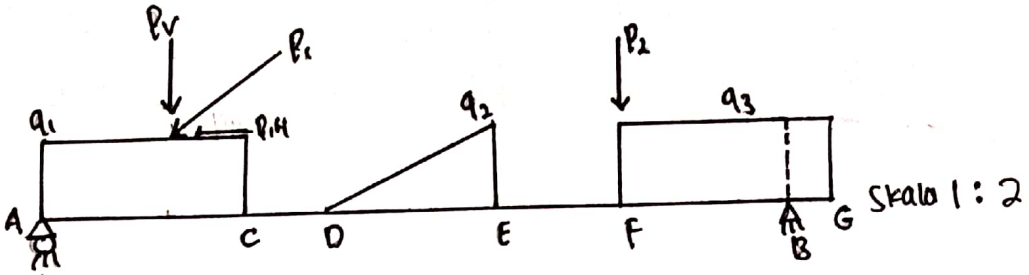
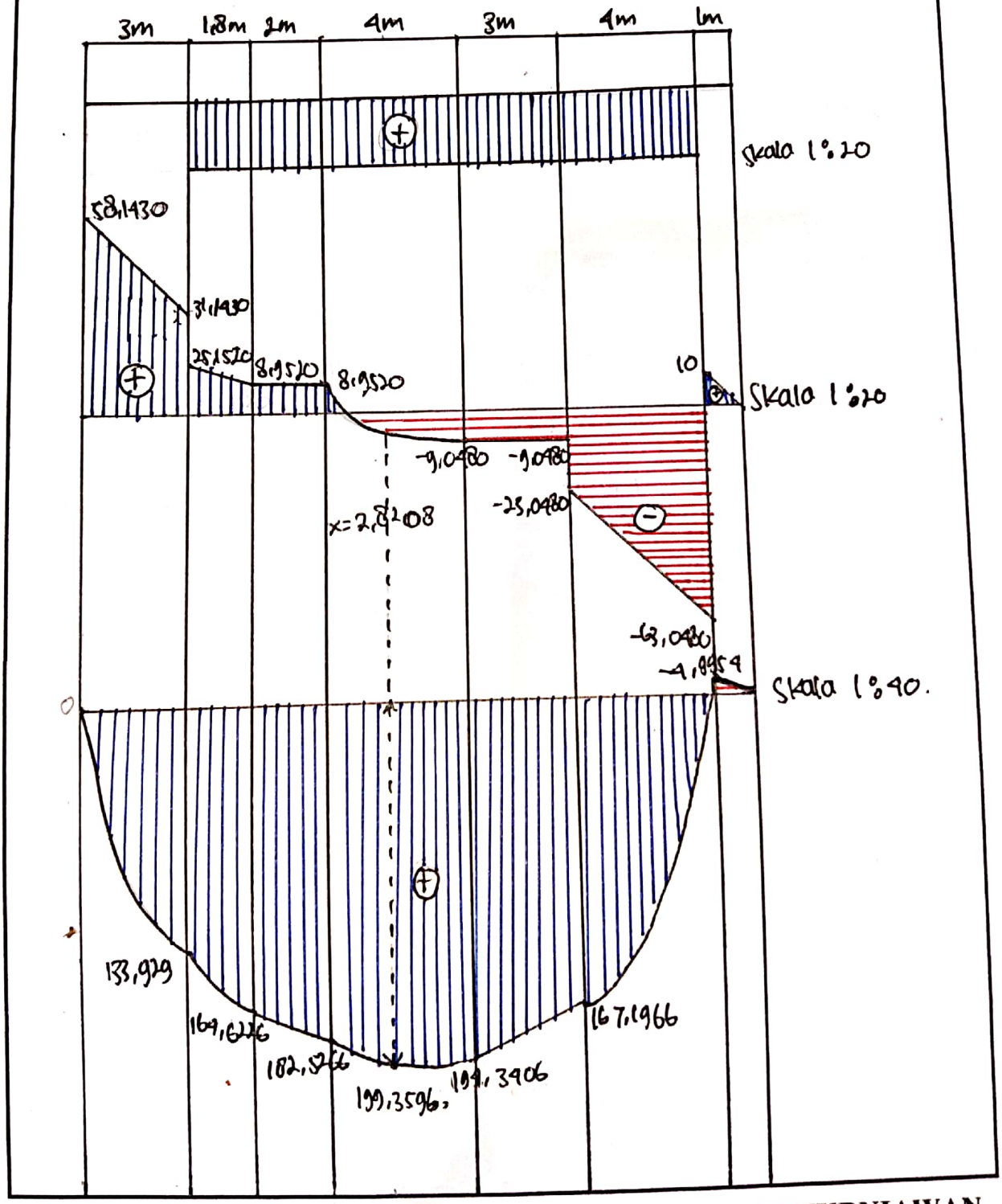
Gambar Bidang Momen, Lintang, dan Normal.





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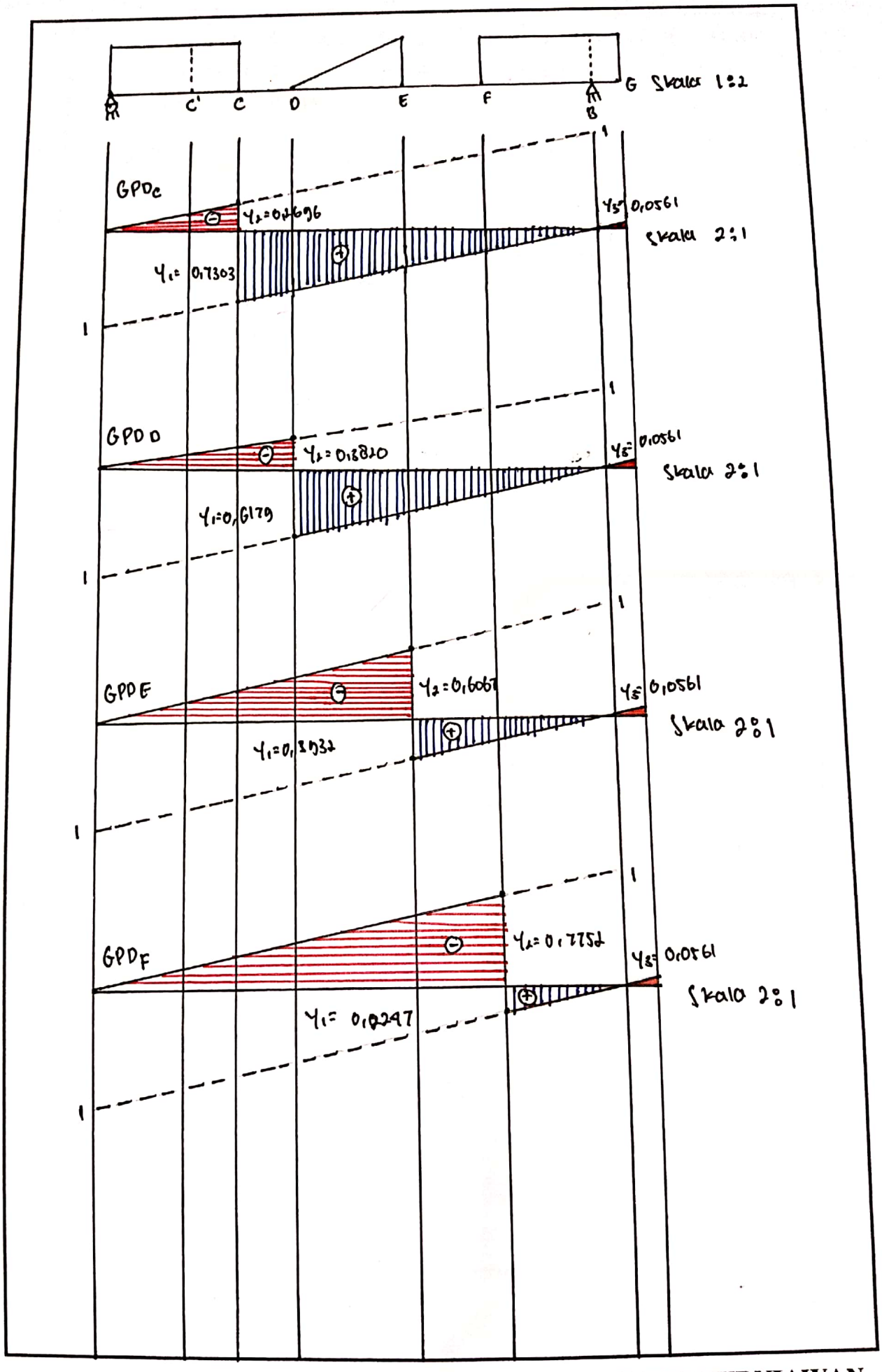

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b. Hitung dan gambar garis Pengaruh momen dan lintang akibat beban jika P = 1 ton bergerak dari tumpuan A ke B pada Potongan C, D, E dan F.

- Garis Pengaruh Lintang (GPD)

•) Titik C

↳ •) y_1 Positif $= \frac{c+d+e+f}{a+b+c+d+e+f} = \frac{13}{17,8} = 0,7303$

$= y_1^+ c \cdot P = 0,7303 \cdot 1 = 0,7303$ m

•) y_2 negatif $= \frac{a+b}{a+b+c+d+e+f} = \frac{4,8}{17,8} = 0,2696$

$= y_2^- C \cdot P = 0,2696 \cdot 1 = 0,2696$ m

•) y_3 negatif ⇒ $\frac{\text{tinggi } \Delta \text{ Besar}}{\text{tinggi } \Delta \text{ kecil}} = \frac{\text{Panjang } \Delta \text{ Besar}}{\text{Panjang } \Delta \text{ kecil}} \Rightarrow \frac{1}{y_3} = \frac{17,8}{1}$

$\Rightarrow y_3 = \frac{1}{17,8} = 0,0861$ m.

•) Titik D

↳ •) y_1 Positif $= \frac{d+e+f}{a+b+c+d+e+f} = \frac{11}{17,8} = 0,6179$

$= y_1^+ D \cdot P = 0,6179 \cdot 1 = 0,6179$ m

•) y_2 negatif $= \frac{a+b+c}{a+b+c+d+e+f} = \frac{6,8}{17,8} = 0,3820$

$= y_2^- D \cdot P = 0,3820 \cdot 1 = 0,3820$ m.

•) y_3 negatif ⇒ $\frac{\text{tinggi } \Delta \text{ Besar}}{\text{tinggi } \Delta \text{ kecil}} = \frac{\text{Panjang } \Delta \text{ Besar}}{\text{Panjang } \Delta \text{ kecil}} \Rightarrow \frac{1}{y_3} = \frac{17,8}{1}$

$\Rightarrow y_3 = 0,0561$ m

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•) Titik E

↳ •) Y_1 Positif $= \frac{e+f}{a+b+c+d+e+f} = \frac{7}{17,8} = 0,3932$

$= Y_1^+E \cdot P = 0,3932 \cdot 1 = 0,3932$ m.

•) Y_2 negatif $= \frac{a+b+c+d}{a+b+c+d+e+f} = \frac{10,8}{17,8} = 0,6067$

$= Y_2^-E \cdot P = 0,6067 \cdot 1 = 0,6067$ m

•) Y_3 negatif $\Rightarrow \frac{\text{tinggi } \Delta \text{ Besar}}{\text{tinggi } \Delta \text{ kecil}} = \frac{\text{Panjang } \Delta \text{ Besar}}{\text{Panjang } \Delta \text{ kecil}} \Rightarrow \frac{1}{Y_3} = \frac{17,8}{1}$

$\Rightarrow Y_3 = 0,0561$ m

•) Titik F

↳ •) Y_1 Positif $= \frac{f}{a+b+c+d+e+f} = \frac{4}{17,8} = 0,2247$

$= Y_1^+F \cdot P = 0,2247 \cdot 1 = 0,2247$ m

•) Y_2 negatif $= \frac{a+b+c+d+e}{a+b+c+d+e+f} = \frac{13,8}{17,8} = 0,7752$

$= Y_2^-F \cdot P = 0,7752 \cdot 1 = 0,7752$ m.

•) Y_3 negatif $\Rightarrow \frac{\text{tinggi } \Delta \text{ Besar}}{\text{tinggi } \Delta \text{ kecil}} = \frac{\text{Panjang } \Delta \text{ Besar}}{\text{Panjang } \Delta \text{ kecil}} \Rightarrow \frac{1}{Y_3} = \frac{17,8}{1}$

$\Rightarrow Y_3 = 0,0561$ m

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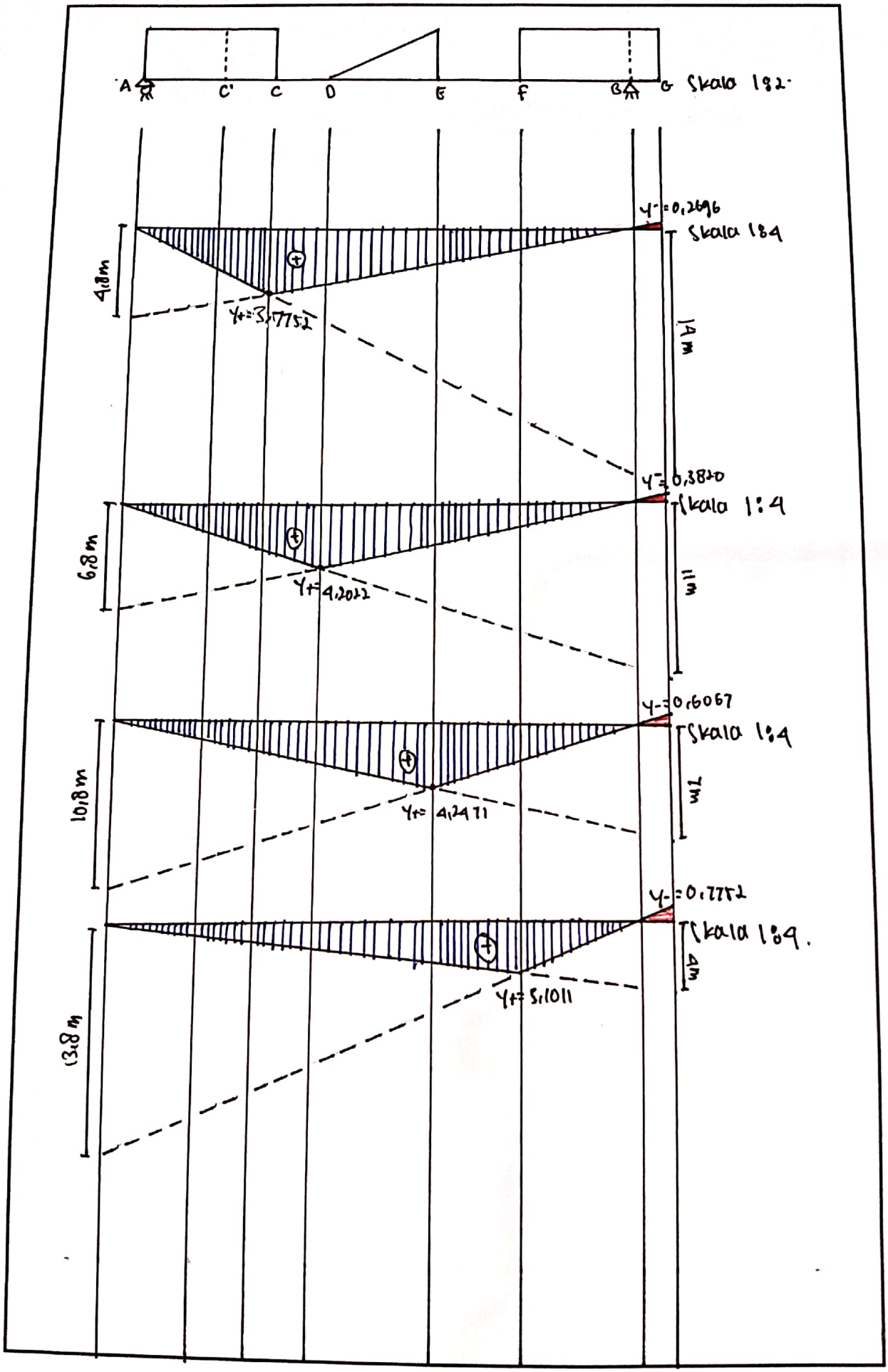

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- Garis Pengaruh Momen (GPM)

•) Titik C

↳ •) Y Positif $= \frac{(a+b).(c+d+e+f)}{(a+b+c+d+e+f)} = \frac{(4,8).(14)}{(17,8)} = \frac{67,2}{17,8} = 3,7752$

$= Y^{+}c \cdot P \quad = 3,7752 \cdot 1 = 3,7752 \text{ m}$

•) Y negatif $= \frac{(a+b).g}{(a+b+c+d+e+f)} = \frac{(4,8).1}{(17,8)} = \frac{4,8}{17,8} = 0,2696$

$= Y^{-}c \cdot P \quad = 0,2696 \cdot 1 = 0,2696 \text{ m}$

•) Titik D

↳ •) Y Positif $= \frac{(a+b+c)(d+e+f)}{(a+b+c+d+e+f)} = \frac{(6,8)(11)}{(17,8)} = \frac{74,8}{17,8} = 4,2022$

$= Y^{+}D \cdot P \quad = 4,2022 \cdot 1 = 4,2022 \text{ m}$

•) Y negatif $= \frac{(a+b+c).g}{(a+b+c+d+e+f)} = \frac{(6,8).1}{(17,8)} = \frac{6,8}{17,8} = 0,3820$

$= Y^{-}D \cdot P \quad = 0,3820 \cdot 1 = 0,3820 \text{ m}$

•) Titik E

↳ •) Y Positif $= \frac{(a+b+c+d)(e+f)}{(a+b+c+d+e+f)} = \frac{(10,8)(7)}{(17,8)} = \frac{75,6}{17,8} = 4,2471$

$= Y^{+}E \cdot P \quad = 4,2471 \cdot 1 = 4,2471 \text{ m}$

•) Y negatif $= \frac{(a+b+c+d).g}{(a+b+c+d+e+f)} = \frac{(10,8).1}{(17,8)} = \frac{10,8}{17,8} = 0,6067$

$= Y^{-}E \cdot P \quad = 0,6067 \cdot 1 = 0,6067 \text{ m}.$

•) Titik F

↳ •) Y Positif $= \frac{(a+b+c+d+e)(f)}{(a+b+c+d+e+f)} = \frac{(13,8)(4)}{(17,8)} = \frac{55,2}{17,8} = 3,1011$

$= Y^{+}F \cdot P \quad = 3,1011 \cdot 1 = 3,1011 \text{ m}.$

•) Y negatif $= \frac{(a+b+c+d+e).g}{(a+b+c+d+e+f)} = \frac{(13,8).1}{(17,8)} = \frac{13,8}{17,8} = 0,7752$

$= Y^{-}F \cdot P \quad = 0,7752 \cdot 1 = 0,7752 \text{ m}.$

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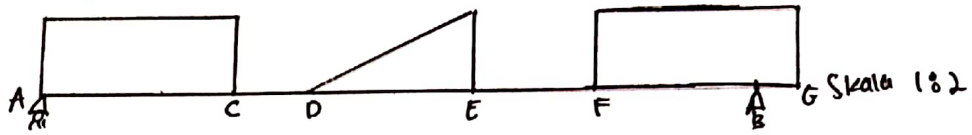
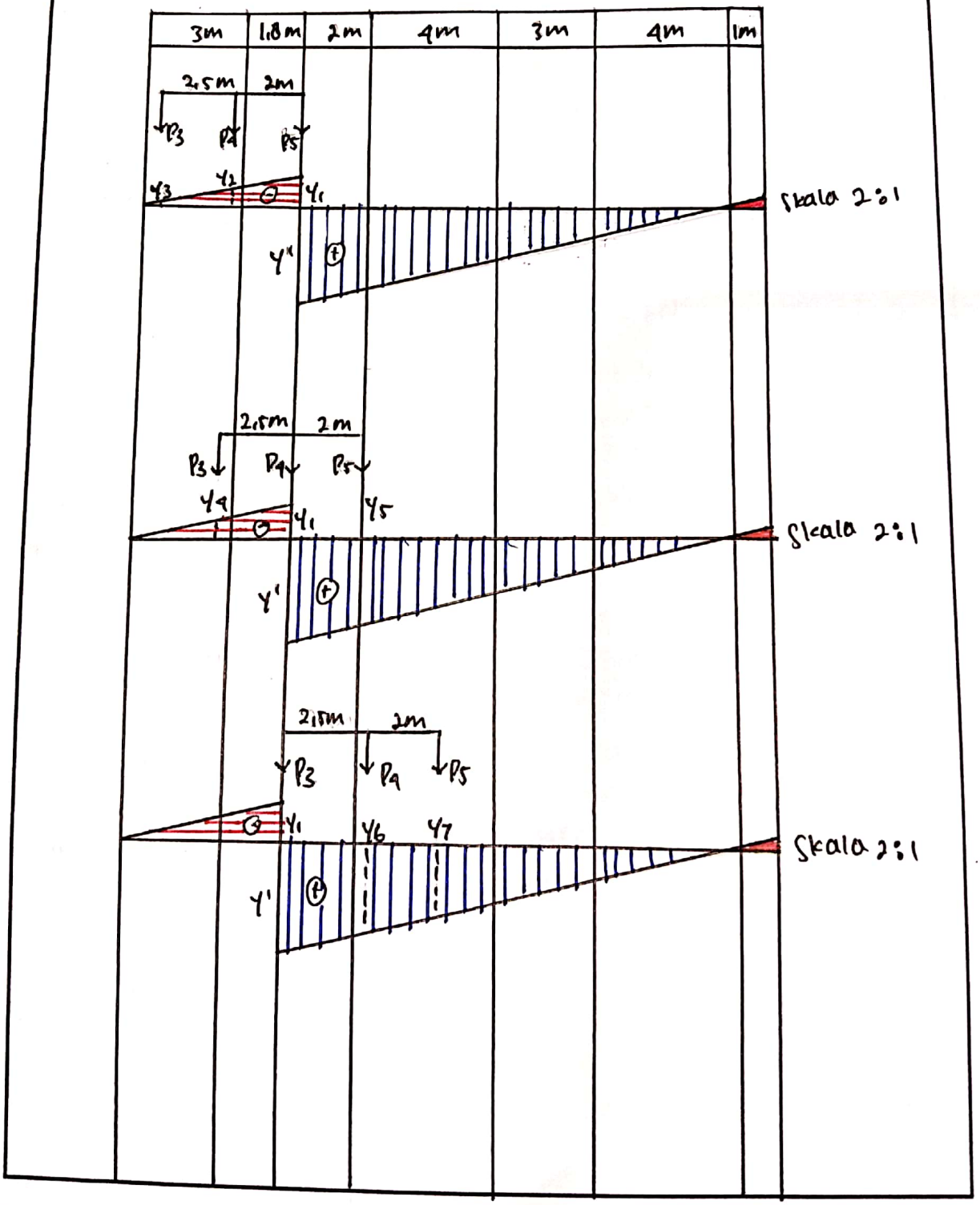
C. Hitung nilai momen ekstrim dan Lintang ekstrim pada potongan C, D, E, dan F akibat rangkaian beban berjalan (P_3, P_4, P_5) dari A ke B.

- Lintang ekstrim Di titik C Akibat Beban Berjalan.





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⇒ kondisi 1

y_1 : Lintang Negatif

$y_1 = \frac{4{,}8}{17{,}8} = 0{,}2697$

$y_2 = \frac{2{,}8}{17{,}8} = 0{,}1573$

$y_3 = \frac{0{,}3}{17{,}8} = 0{,}0168$

$Dc = -P_3(y_3) - P_4(y_2) - P_5(y_1)$
$= -15(0{,}0168) - 19(0{,}1573) - 20(0{,}2697)$
$= -0{,}252 - 2{,}9887 - 5{,}394$
$= -8{,}6347$ kN

- Lintang Positif

$y' = \frac{13}{17{,}8} = 0{,}7303$

$Dc = P_5(y_4)$
$= 20(0{,}7303)$
$= 14{,}606$ kN.

⇒ kondisi 2

- Lintang Negatif

$y_1 = \frac{4{,}8}{17{,}8} = 0{,}2697$

$y_4 = \frac{2{,}3}{17{,}8} = 0{,}1292$

$Dc = -P_3(y_4) - P_4(y_1)$
$= -15(0{,}1292) - 19(0{,}2697)$
$= -1{,}938 - 5{,}1243$
$= -7{,}0623$ kN.

- Lintang Positif

$y' = \frac{13}{17{,}8} = 0{,}7303$

$y_5 = \frac{11}{17{,}8} = 0{,}6179$

$Dc = P_4(y') + P_5(y_5)$
$= 19(0{,}7303) + 20(0{,}6179)$
$= 13{,}8757 + 12{,}358$
$= 26{,}2337$ kN.

⇒ kondisi 3

- Lintang Negatif

$y_1 = \frac{4{,}8}{17{,}8} = 0{,}2697$

$Dc = -P_3(y_1)$
$= -15(0{,}2697)$
$= -4{,}0455$ kN.

- Lintang Positif

$y' = \frac{13}{17{,}8} = 0{,}7303$

$y_6 = \frac{10{,}5}{17{,}8} = 0{,}5899$

$y_7 = \frac{8{,}5}{17{,}8} = 0{,}4775$

$Dc = P_3(y') + P_4(y_6) + P_5(y_7)$
$= 15(0{,}7303) + 19(0{,}5899) + 20(0{,}4775)$
$= 10{,}9545 + 11{,}2081 + 9{,}55$
$= 31{,}7126$ kN.

* Lintang Positif (Dc max) terjadi pada kondisi 3 = 31,7126 kN.
* Lintang Negatif (Dc min) terjadi pada kondisi 1 = −8,6347 kN.

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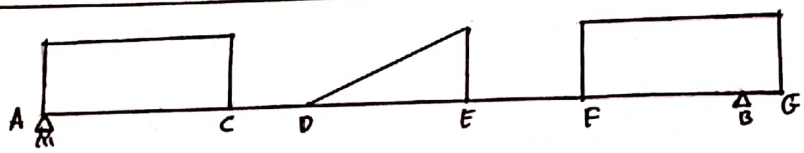
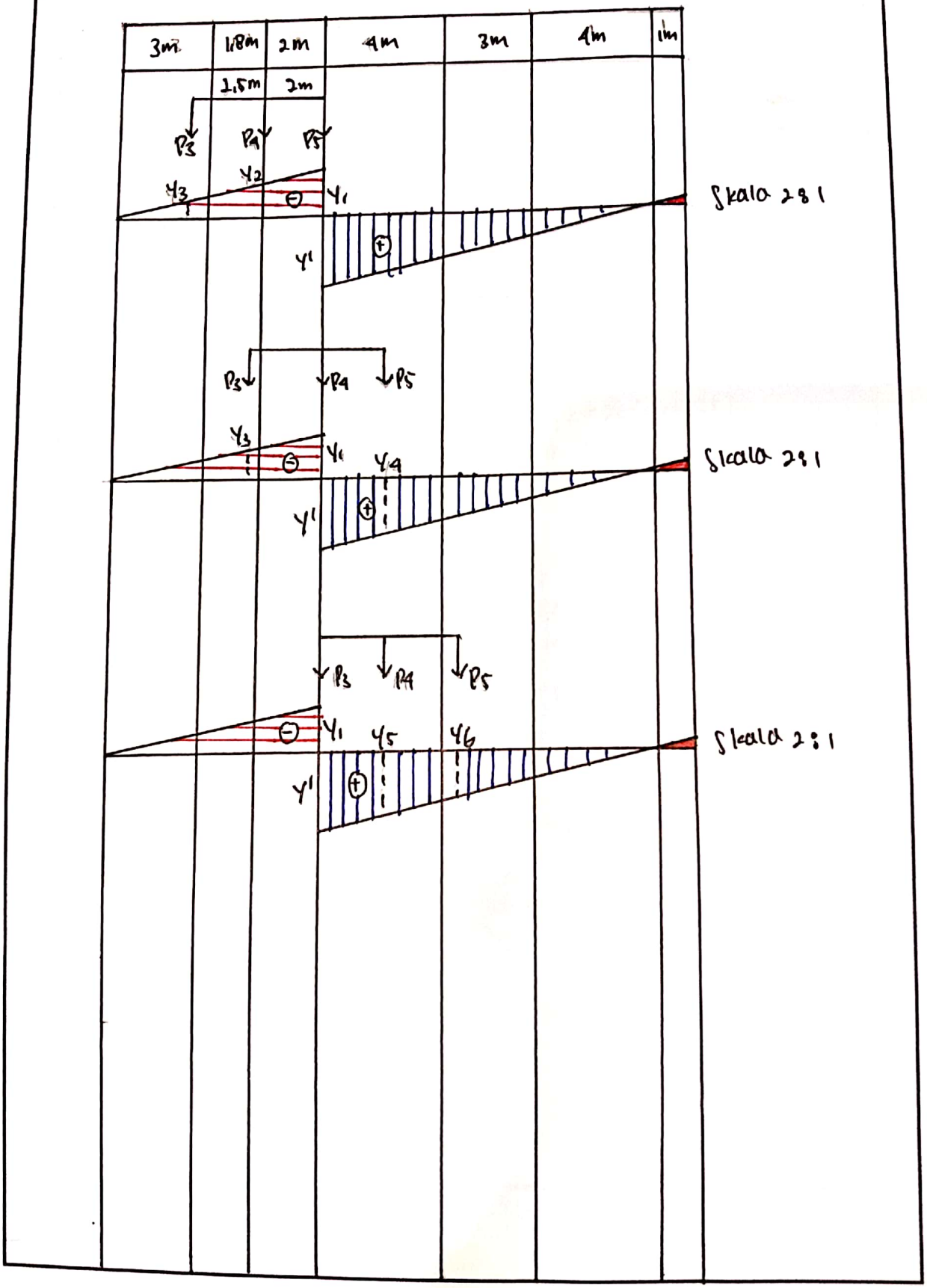
- Lintang Ekstrim Di Titik D Akibat Rangkaian Beban Berjalan.



Skala 1:2



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⇒ kondisi 1

- Lintang Negatif

$y_1 = \frac{6{,}8}{17{,}8} = 0{,}3820$

$y_2 = \frac{4{,}8}{17{,}8} = 0{,}2697$

$y_3 = \frac{2{,}3}{17{,}8} = 0{,}1292$

$D_D = -P_3(y_3) - P_4(y_2) - P_5(y_1)$
$= -15(0{,}1292) - 19(0{,}2697) - 20(0{,}3820)$
$= -1{,}938 - 5{,}1243 - 7{,}64$
$= -14{,}7023$ kN.

- Lintang Positif

$y' = \frac{11}{17{,}8} = 0{,}6180$

$D_D = P_5(y')$
$= 20(0{,}6180)$
$= 12{,}36$ kN.

⇒ kondisi 2

- Lintang Negatif

$y_1 = \frac{6{,}8}{17{,}8} = 0{,}3820$

$y_3 = \frac{4{,}3}{17{,}8} = 0{,}2416$

$D_D = -P_3(y_3) - P_4(y_1)$
$= -15(0{,}2416) - 19(0{,}3820)$
$= -3{,}624 - 7{,}258$
$= -10{,}882$ kN.

- Lintang Positif

$y' = \frac{11}{17{,}8} = 0{,}6180$

$y_4 = \frac{9}{17{,}8} = 0{,}5056$

$D_D = P_4(y') + P_5(y_4)$
$= 19(0{,}6180) + 20(0{,}5056)$
$= 11{,}742 + 10{,}112$
$= 21{,}854$ kN.

⇒ kondisi 3

- Lintang Negatif

$y_1 = \frac{6{,}8}{17{,}8} = 0{,}3820$

$D_D = -P_3(y_1)$
$= -15(0{,}3820)$
$= -5{,}73$ kN

- Lintang Positif

$y' = \frac{11}{17{,}8} = 0{,}6180$

$y_5 = \frac{8{,}5}{17{,}8} = 0{,}4775$

$y_6 = \frac{6{,}5}{17{,}8} = 0{,}3652$

$D_D = P_3(y') + P_4(y_5) + P_5(y_6)$
$= 15(0{,}6180) + 19(0{,}4775) + 20(0{,}3652)$
$= 9{,}27 + 9{,}0725 + 7{,}304$
$= 25{,}6465$ kN

* Lintang Positif (D_{Dmax}) terjadi pada kondisi 3 = 25,6465 kN.
* Lintang Negatif (D_{Dmin}) terjadi pada kondisi 1 = −14,7023 kN.

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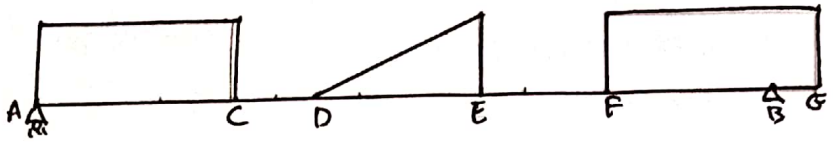
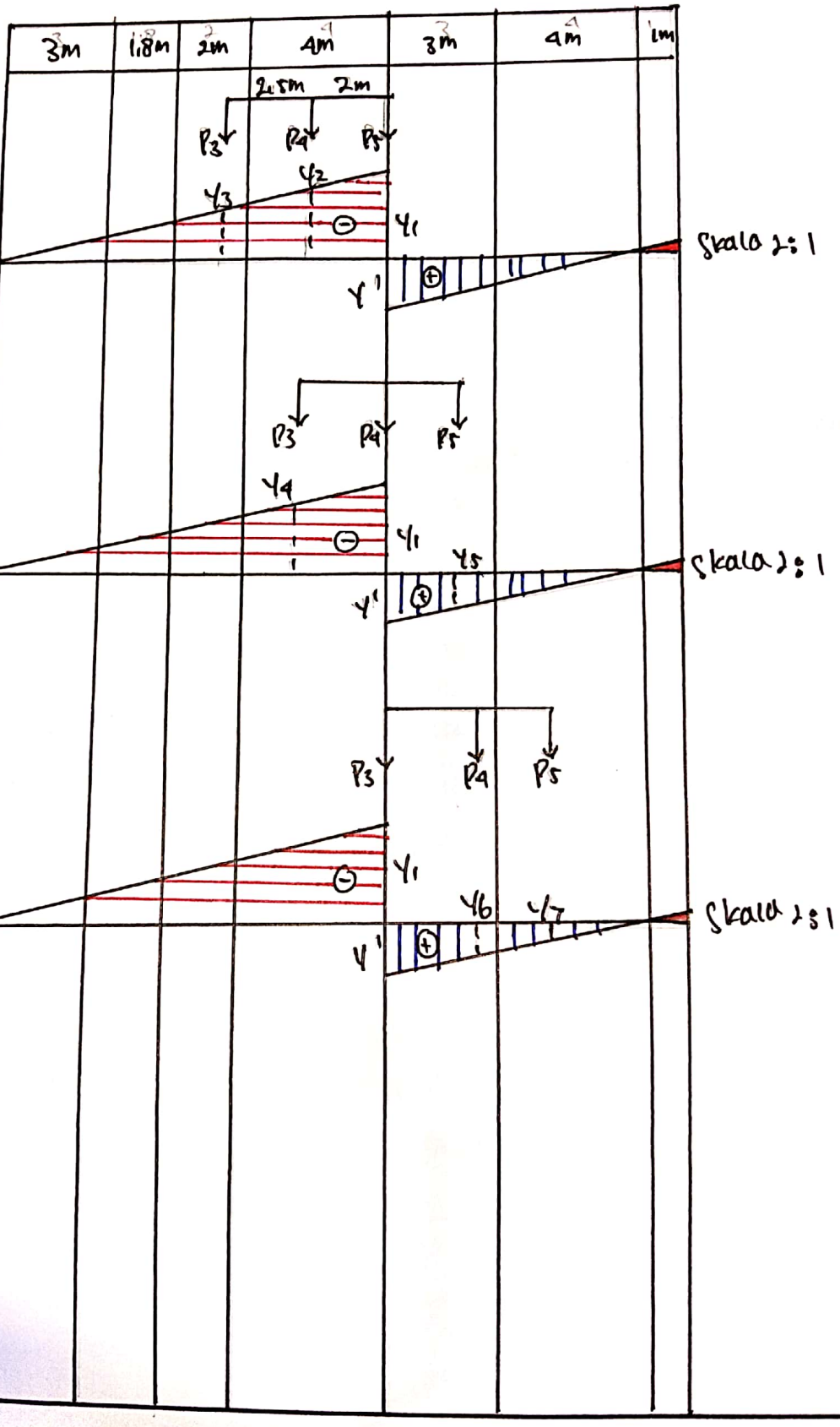
- Lintang Ekstrim Di Titik E Akibat Rangkaian Beban Berjalan



Skala 1 : 2



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⇒ Kondisi 1

- Lintang Negatif

$y_1 = \frac{10,8}{17,8} = 0,6067$

$y_2 = \frac{8,8}{17,8} = 0,4944$

$y_3 = \frac{6,3}{17,8} = 0,3539$

$D_E = -P_3(y_3) - P_4(y_2) - P_5(y_1)$
$= -15(0,3539) - 19(0,4944) - 20(0,6067)$
$= -5,3085 - 9,3936 - 12,134$
$= -26,8361$ kN.

- Lintang Positif

$y' = \frac{7}{17,8} = 0,3933$

$D_E = P_5(y')$
$= 20(0,3933)$
$= 7,866$ kN.

⇒ Kondisi 2

- Lintang Negatif

$y_1 = \frac{10,8}{17,8} = 0,6067$

$y_4 = \frac{8,3}{17,8} = 0,4663$

$D_E = -P_3(y_4) - P_4(y_1)$
$= -15(0,4663) - 19(0,6067)$
$= -6,9945 - 11,5273$
$= -18,5218$ kN.

- Lintang Positif

$y' = \frac{7}{17,8} = 0,3933$

$y_5 = \frac{5}{17,8} = 0,2809$

$D_E = P_4(y') + P_5(y_5)$
$= 19(0,3933) + 20(0,2809)$
$= 7,4727 + 5,618$
$= 13,0907$ kN.

⇒ Kondisi 3

- Lintang Negatif

$y_1 = \frac{10,8}{17,8} = 0,6067$

$D_E = -P_3(y_1)$
$= -15(0,6067)$
$= -9,1005$ kN.

- Lintang Positif

$y' = \frac{7}{17,8} = 0,3933$

$y_6 = \frac{9,5}{17,8} = 0,2528$

$y_7 = \frac{2,5}{17,8} = 0,1404$

$D_E = P_3(y') + P_4(y_6) + P_5(y_7)$
$= 15(0,3933) + 19(0,2528) + 20(0,1404)$
$= 5,8995 + 4,8032 + 2,808$
$= 13,5107$ kN.

* Lintang Positif ($D_{E\,max}$) terjadi pada kondisi 3 = 13,5107 kN.

* Lintang Negatif ($D_{E\,min}$) terjadi pada kondisi 1 = −26,8361 kN.

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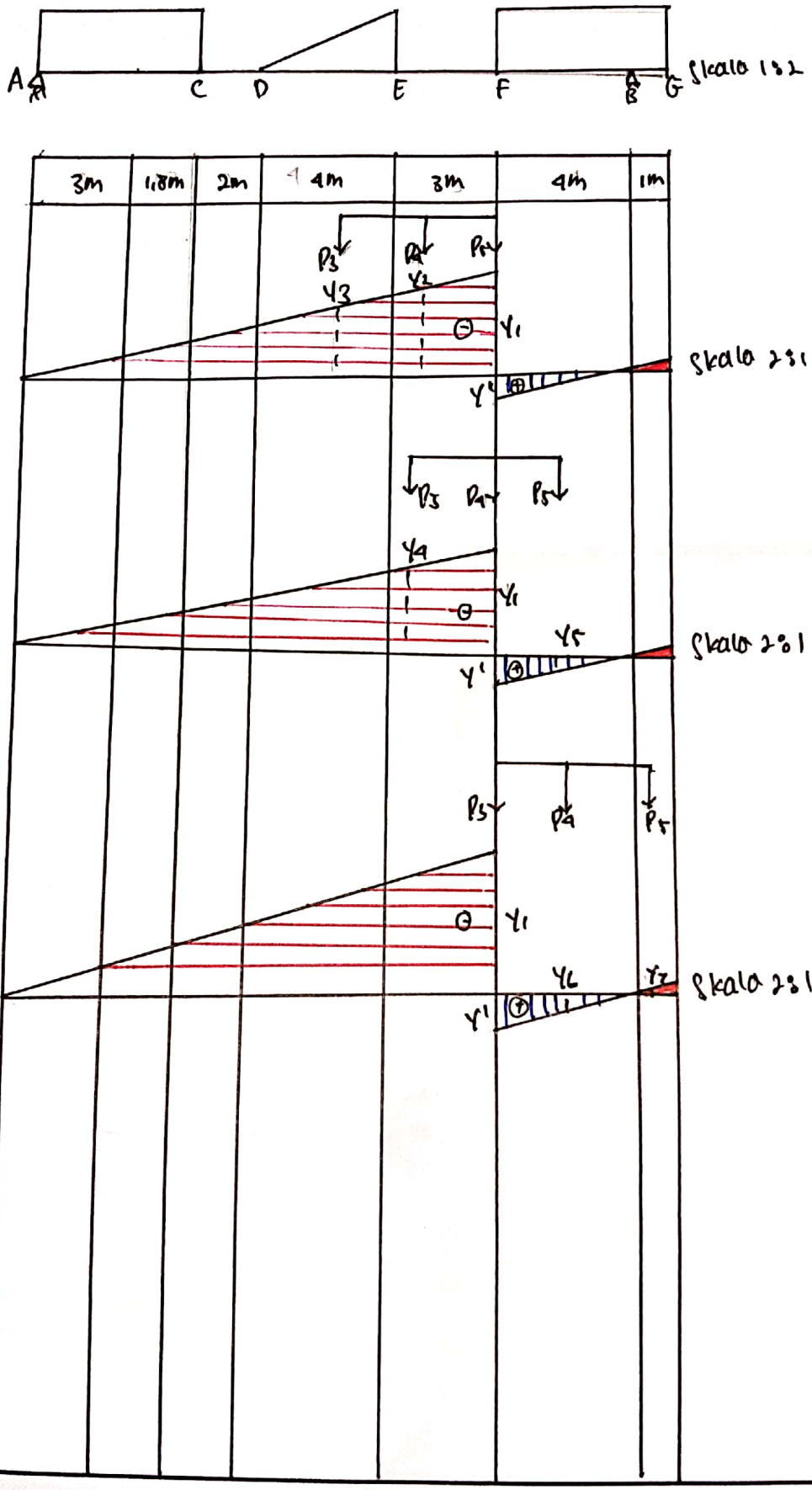
- Lintang ekstrim di titik F akibat beban berjalan



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⇒ Kondisi 1

- Lintang Negatif

$y_1 = \frac{13.8}{17.8} = 0.7753$

$y_2 = \frac{11.8}{17.8} = 0.6629$

$y_3 = \frac{9.3}{17.8} = 0.5224$

$D_F = -P_3(y_3) - P_4(y_2) - P_5(y_1)$
$= -15(0.5224) - 19(0.6629) - 20(0.7753)$
$= -7.836 - 12.5951 - 15.506$
$= -35.9371$ kN.

- Lintang Positif

$y' = \frac{4}{17.8} = 0.2247$

$D_F = P_5(y')$
$= 20(0.2247)$
$= 4.494$ kN.

⇒ kondisi 2

- Lintang Negatif

$y_1 = \frac{13.8}{17.8} = 0.7753$

$y_4 = \frac{11.3}{17.8} = 0.6348$

$D_F = -P_3(y_4) - P_4(y_1)$
$= -15(0.6348) - 19(0.7753)$
$= -9.522 - 14.7307$
$= -24.2527$ kN.

- Lintang Positif

$y' = \frac{4}{17.8} = 0.2247$

$y_5 = \frac{2}{17.8} = 0.1124$

$D_F = P_4(y') + P_5(y_5)$
$= 19(0.2247) + 20(0.1124)$
$= 4.2693 + 2.248$
$= 6.5173$ kN.

⇒ kondisi 3

- Lintang Negatif

$y_1 = \frac{13.8}{17.8} = 0.7753$

$y_7 = \frac{0.5}{17.8} = 0.0281$

$D_F = -P_5(y_1)$
$= -15(0.7753)$
$= -11.6295$
$= -11.6295$ kN.

- Lintang positif

$y' = \frac{4}{17.8} = 0.2247$

$y_6 = \frac{1.5}{17.8} = 0.0843$

$D_F = P_3(y') + P_4(y_6)$
$= 15(0.2247) + 19(0.0843)$
$= 3.3705 + 1.6017$
$= 4.9722$ kN.

* Lintang Positif (D_F max) terjadi pada kondisi 2 = 6.5173 kN
* Lintang Negatif (D_F min) terjadi pada kondisi 1 = -35.9371 kN.

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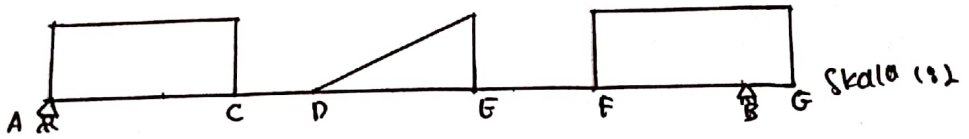
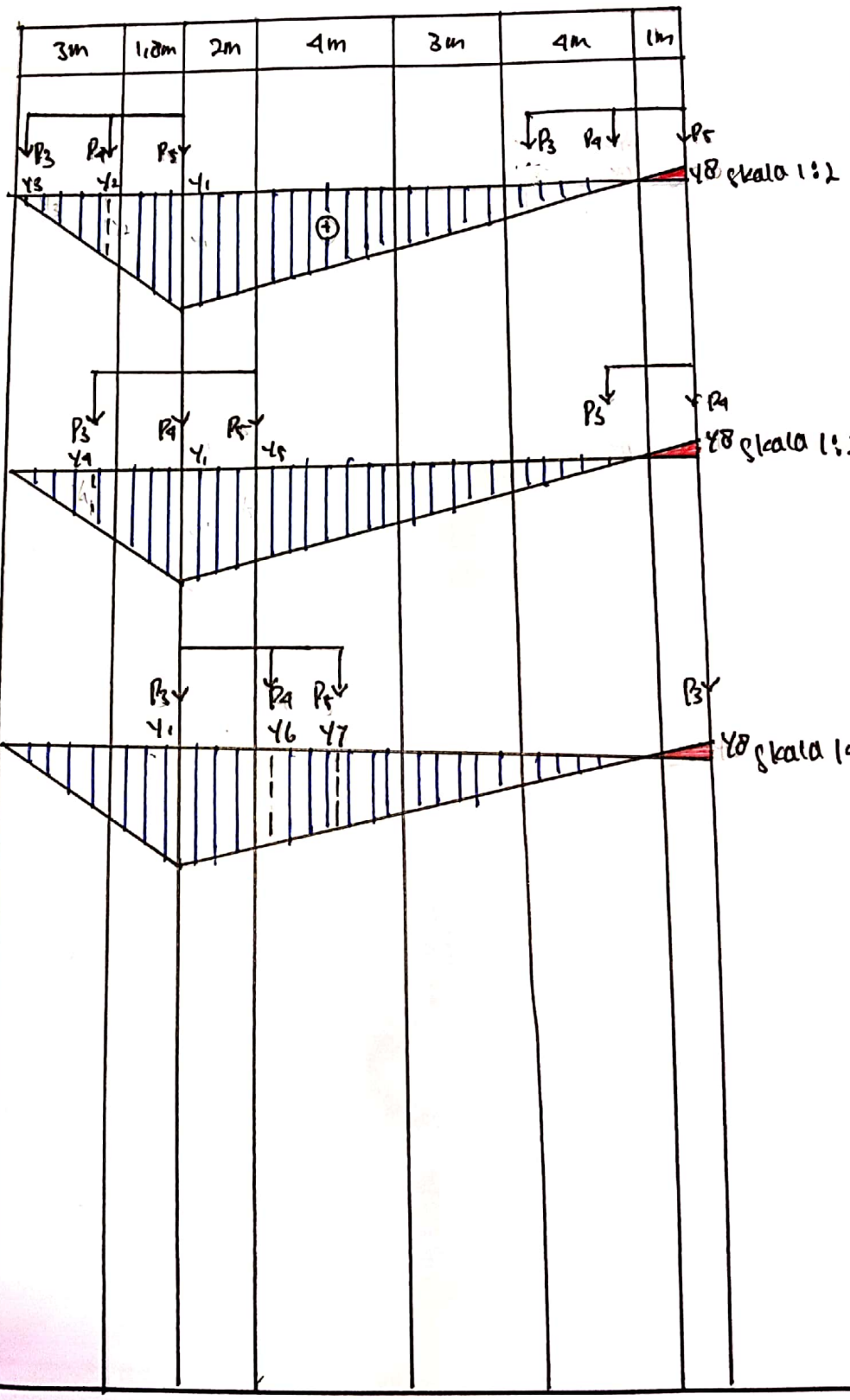
- Momen maksimum pada titik C Akibat Beban berjalan.





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⇒ kondisi 1

- Momen positif

$y_1 = \frac{4{,}18 \cdot 13}{17{,}8} = 3{,}5056$

$y_2 = \frac{2{,}8 \cdot 13}{17{,}8} = 2{,}0449$

$y_3 = \frac{0{,}15 \cdot 13}{17{,}8} = 0{,}2191$

$Mc = P_3(y_3) + P_4(y_2) + P_5(y_1)$
$= 15(0{,}2191) + 19(2{,}0449) + 20(3{,}5056)$
$= 3{,}2865 + 38{,}8531 + 70{,}112$
$= 112{,}2516$ kN.

- Momen Negatif

$y_8 = \frac{1 \cdot 4{,}18}{17{,}8} = 0{,}2697$

$Mc = -P_5(y_8)$
$= -20(0{,}2697$
$= -5{,}394$ kN.

⇒ kondisi 2

- Momen positif

$y_1 = \frac{4{,}18 \cdot 13}{17{,}8} = 3{,}5056$

$y_4 = \frac{2{,}8 \cdot 13}{17{,}8} = 1{,}6798$

$y_5 = \frac{4{,}18 \cdot 11}{17{,}8} = 2{,}9662$

$Mc = P_3(y_4) + P_4(y_1) + P_5(y_5)$
$= 15(1{,}6798) + 19(3{,}5056) + 20(2{,}9662)$
$= 25{,}197 + 66{,}6064 + 59{,}324$
$= 151{,}1274$ kN.

- Momen Negatif

$y_8 = \frac{1 \cdot 4{,}18}{17{,}8} = 0{,}2697$

$Mc = -P_4(y_8)$
$= -19(0{,}2697)$
$= -5{,}1243$ kN.

⇒ kondisi 3

- Momen positif

$y_1 = \frac{4{,}18 \cdot 3}{17{,}8} = 3{,}5056$

$y_6 = \frac{4{,}18 \cdot 10{,}5}{17{,}8} = 2{,}8315$

$y_7 = \frac{4{,}18 \cdot 8{,}5}{17{,}8} = 2{,}2921$

$Mc = P_6(y_1) + P_4(y_6) + P_5(y_7)$
$= 15(3{,}5056) + 19(2{,}8315) + 20(2{,}2921)$
$= 52{,}584 + 53{,}7985 + 45{,}842$
$= 152{,}2245$ kN.

- Momen Negatif

$y_8 = \frac{1 \cdot 4{,}18}{17{,}8} = 0{,}2697$

$Mc = -P_3(y_8)$
$= -15(0{,}2697)$
$= -4{,}0455$ kN.

* Momen positif (Mc max) terjadi pada kondisi 3 = 152,2245 kN.
* Momen Negatif (Mc min) terjadi pada kondisi 1 = -5,394 kN.

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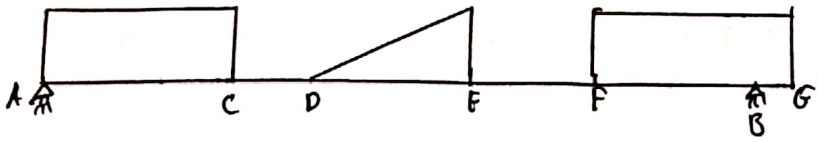
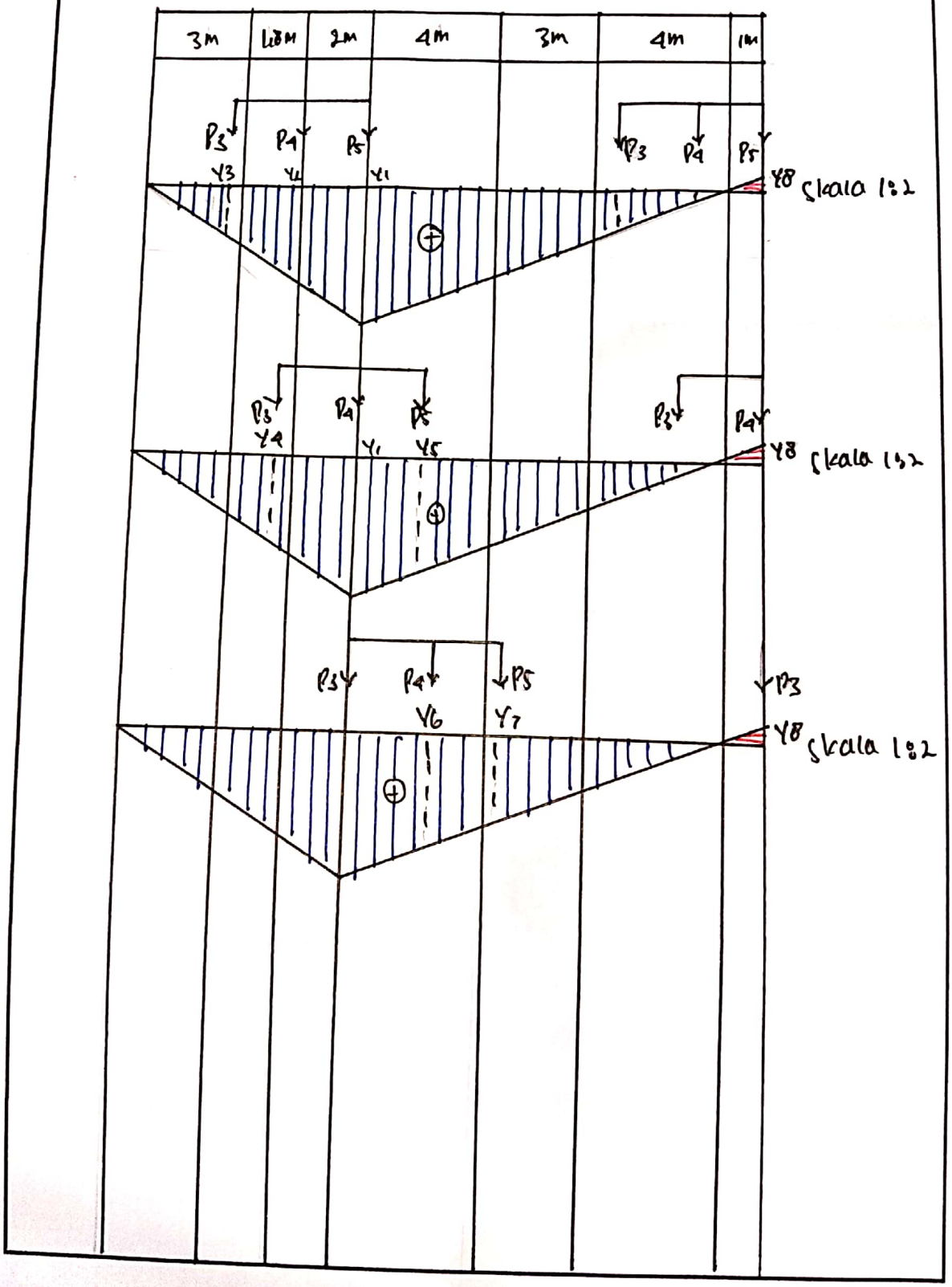
- Momen Ekstrem Pada Titik D Akibat Beban Berjalan.





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⇒ kondisi 1

- Momen positif

$y_1 = \frac{(6{,}8)(11)}{17{,}8} = 4{,}2022$

$y_2 = \frac{4{,}8 \cdot 11}{17{,}8} = 2{,}9662$

$y_3 = \frac{2{,}3 \cdot 11}{17{,}8} = 1{,}4213$

$M_D = P_3(y_3) + P_4(y_2) + P_5(y_1)$
$= 15(1{,}4213) + 19(2{,}9662) + 20(4{,}2022)$
$= 21{,}3195 + 56{,}3578 + 84{,}044$
$= 161{,}7213$ kN/m'

- Momen Negatif

$y_8 = \frac{1 \cdot 6{,}8}{17{,}8} = 0{,}3820$

$M_D = -P_5(y_8)$
$= -20(0{,}3820)$
$= -7{,}64$ kN/m'

⇒ kondisi 2

- Momen positif

$y_1 = \frac{6{,}8 \cdot 11}{17{,}8} = 4{,}2022$

$y_4 = \frac{4{,}3 \cdot 11}{17{,}8} = 2{,}6573$

$y_5 = \frac{9 \cdot 6{,}8}{17{,}8} = 3{,}4382$

$M_D = P_3(y_4) + P_4(y_1) + P_5(y_5)$
$= 15(2{,}6573) + 19(4{,}2022) + 20(3{,}4382)$
$= 39{,}8595 + 79{,}8418 + 68{,}764$
$= 188{,}4653$ kN/m'

- Momen Negatif

$y_8 = \frac{1 \cdot 6{,}8}{17{,}8} = 0{,}3820$

$M_D = -P_4(y_8)$
$= -19(0{,}3820)$
$= -7{,}258$ kN/m'

⇒ kondisi 3

- Momen positif

$y_1 = \frac{6{,}8 \cdot 11}{17{,}8} = 4{,}2022$

$y_6 = \frac{8{,}5 \cdot 6{,}8}{17{,}8} = 3{,}2472$

$y_7 = \frac{6{,}5 \cdot 6{,}8}{17{,}8} = 2{,}4831$

$M_D = P_3(y_1) + P_4(y_6) + P_5(y_7)$
$= 15(4{,}2022) + 19(3{,}2472) + 20(2{,}4831)$
$= 63{,}033 + 61{,}6968 + 49{,}662$
$= 174{,}3918$ kN/m'

- Momen Negatif

$y_8 = \frac{1 \cdot 6{,}8}{17{,}8} = 0{,}3820$

$M_D = -P_3(y_8)$
$= -15(0{,}3820)$
$= -5{,}73$ kN/m'

* Momen positif (Momax) terjadi pada kondisi 2 = 188,4653 kN/m'

* Momen Negatif (Momin) terjadi pada kondisi 1 = -7,64 kN/m'

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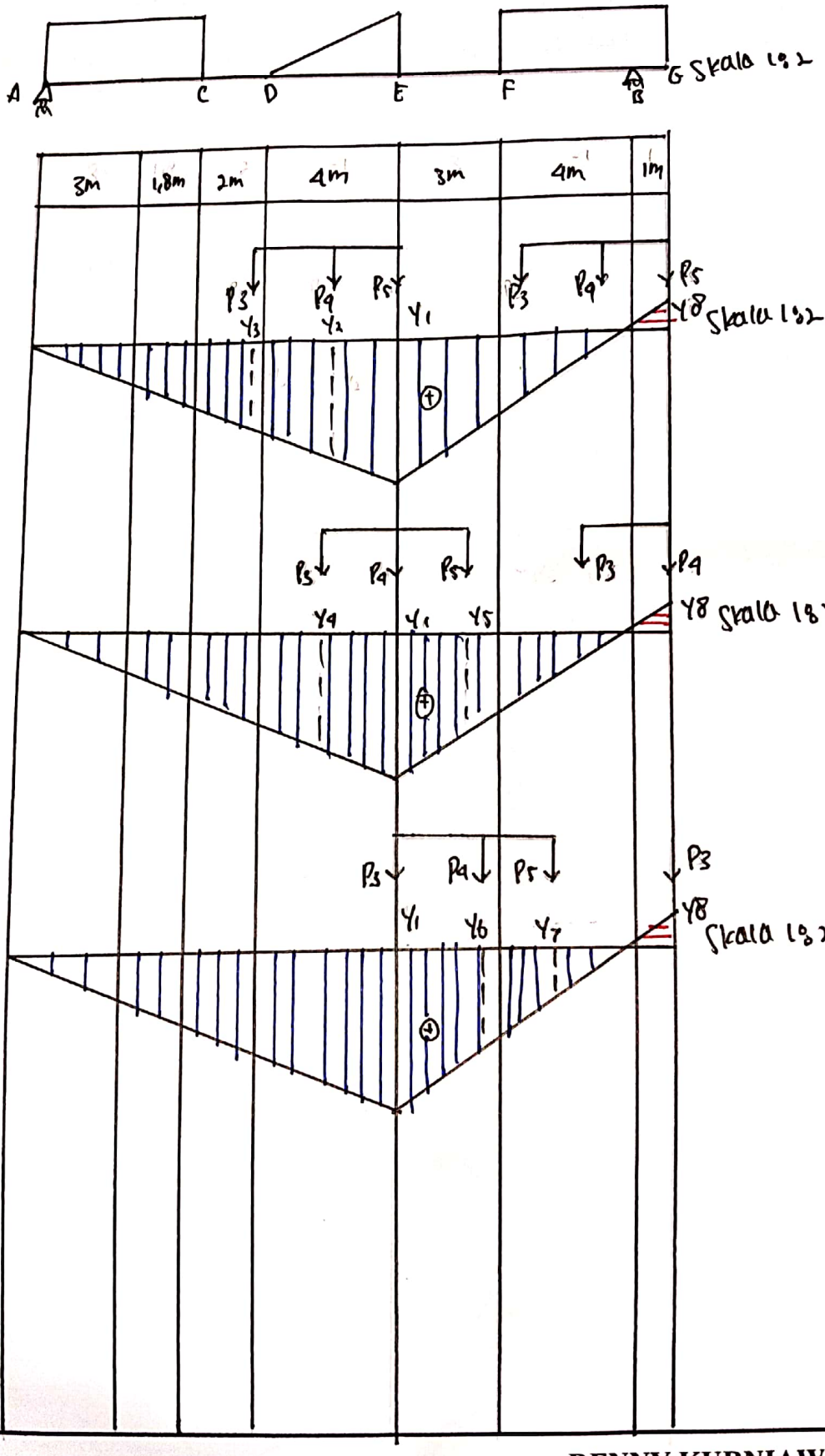
- Momen Ekstrem Pada Titik E Akibat Beban Berjalan.



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⇒ kondisi 1

- Momen Positif

$y_1 = \frac{10{,}8 \cdot 7}{17{,}8} = 4{,}2472$

$y_2 = \frac{8{,}8 \cdot 7}{17{,}8} = 3{,}4607$

$y_3 = \frac{6{,}3 - 7}{17{,}8} = 2{,}4775$

$M_E = P_3(y_3) + P_4(y_2) + P_5(y_1)$
$= 15(2{,}4775) + 19(3{,}4607) + 20(4{,}2472)$
$= 37{,}1625 + 65{,}7533 + 84{,}944$
$= 187{,}8598$ kN/m'

- Momen Negatif

$y_8 = \frac{1 \cdot 10{,}8}{17{,}8} = 0{,}6067$

$M_E = -P_5(y_8)$
$= -20(0{,}6067)$
$= -12{,}134$ kN/m'

⇒ kondisi 2

- Momen Positif

$y_1 = \frac{10{,}8 \cdot 7}{17{,}8} = 4{,}2472$

$y_4 = \frac{8{,}3 \cdot 7}{17{,}8} = 3{,}2640$

$y_5 = \frac{5 \cdot 10{,}8}{17{,}8} = 3{,}0337$

$M_E = P_3(y_4) + P_4(y_2) + P_5(y_5)$
$= 15(3{,}2640) + 19(4{,}2472) + 20(3{,}0337)$
$= 48{,}96 + 80{,}6968 + 60{,}674$
$= 190{,}3308$ kN/m'

- Momen Negatif

$y_8 = \frac{1 \cdot 10{,}8}{17{,}8} = 0{,}6067$

$M_E = -P_4(y_8)$
$= -19(0{,}6067)$
$= -11{,}5273$ kN/m'

⇒ kondisi 3

- Momen Positif

$y_1 = \frac{10{,}8 \cdot 7}{17{,}8} = 4{,}2472$

$y_6 = \frac{4{,}5 \cdot 10{,}8}{17{,}8} = 2{,}7303$

$y_7 = \frac{2{,}5 \cdot 10{,}8}{17{,}8} = 1{,}5169$

$M_E = P_5(y_1) + P_4(y_6) + P_5(y_7)$
$= 15(4{,}2472) + 19(2{,}7303) + 20(1{,}5169)$
$= 63{,}708 + 51{,}8757 + 30{,}338$
$= 145{,}9217$ kN/m'

- Momen Negatif

$y_8 = \frac{1 \cdot 10{,}8}{17{,}8} = 0{,}6067$

$M_E = -P_3(y_8)$
$= -15(0{,}6067)$
$= -9{,}1005$

* Momen positif ($M_{E\,max}$) terjadi pada kondisi 2 = 190,3308 kN/m'
* Momen Negatif ($M_{E\,min}$) terjadi pada kondisi 1 = −12,134 kN/m'

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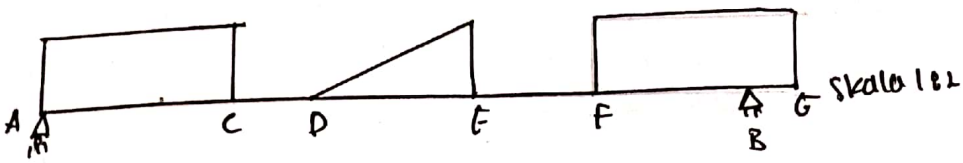
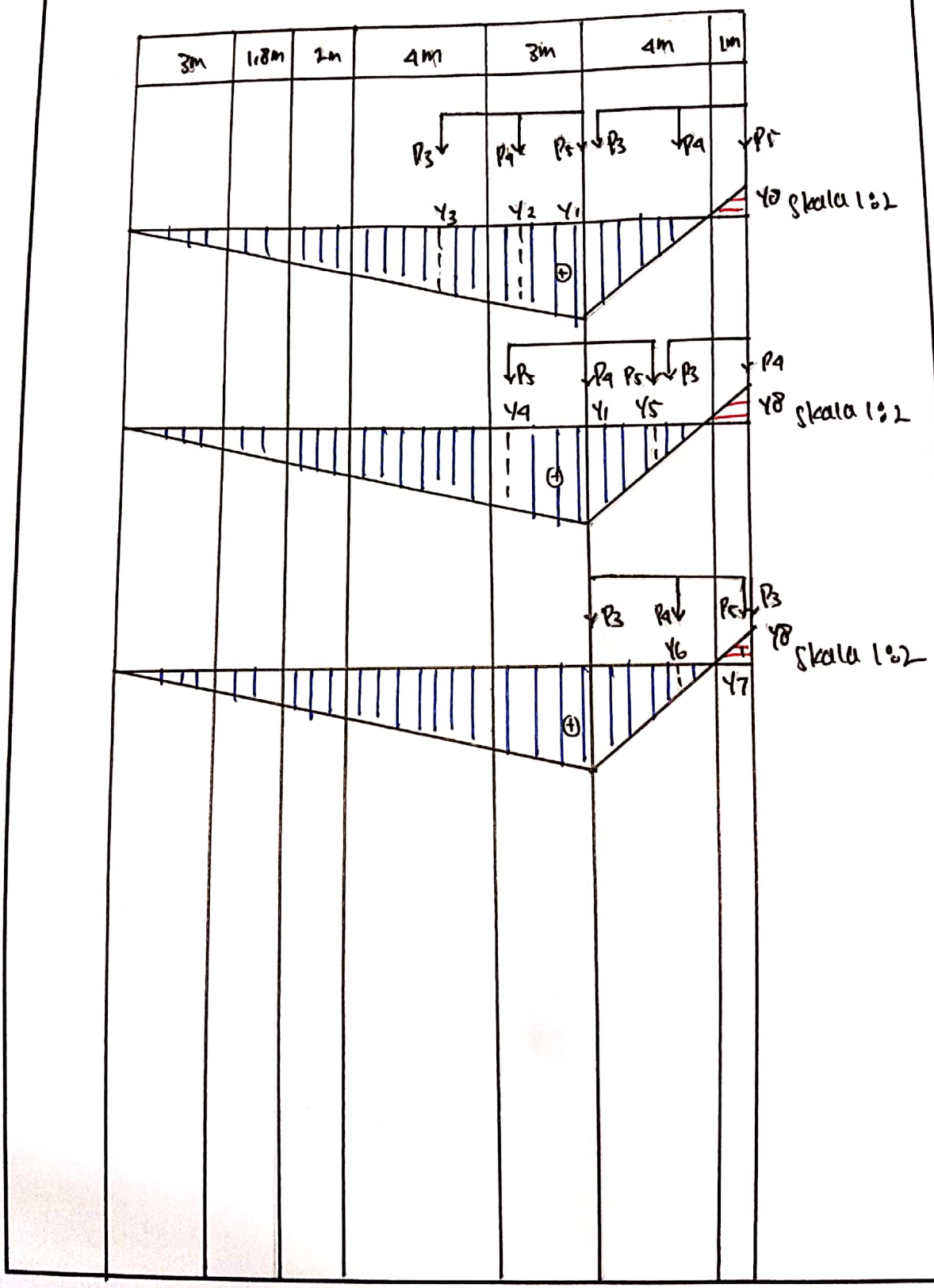
- Momen Elastrem Pada Titik F Akibat Beban Berjalan.





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⇒ kondisi 1

- momen Positif

$y_1 = \frac{13{,}8 \cdot 4}{17{,}8} = 3{,}1011$

$y_2 = \frac{11{,}8 \cdot 4}{17{,}8} = 2{,}6517$

$y_3 = \frac{9{,}3 \cdot 4}{17{,}8} = 2{,}0899$

$M_F = P_3(y_3) + P_4(y_2) + P_5(y_1)$
$= 15(2{,}0899) + 19(2{,}6517) + 20(3{,}1011)$
$= 31{,}3485 + 50{,}3823 + 62{,}012$
$= 143{,}7528$ kN/m'

- momen Negatif

$y_8 = \frac{1 \cdot 13{,}8}{17{,}8} = 0{,}7753$

$M_F = -P_5(y_8)$
$= -20(0{,}7753)$
$= -15{,}506$ kN/m'

⇒ kondisi 2

- Momen Positif

$y_1 = \frac{13{,}8 \cdot 4}{17{,}8} = 3{,}1011$

$y_4 = \frac{11{,}3 \cdot 4}{17{,}8} = 2{,}5393$

$y_5 = \frac{2 \cdot 13{,}8}{17{,}8} = 1{,}5506$

$M_F = P_3(y_4) + P_4(y_1) + P_5(y_5)$
$= 15(2{,}5393) + 19(3{,}1011) + 20(1{,}5506)$
$= 38{,}0895 + 58{,}9209 + 31{,}012$
$= 128{,}0224$ kN/m'

- Momen Negatif

$y_8 = \frac{1 \cdot 13{,}8}{17{,}8} = 0{,}7753$

$M_F = -P_4(y_8)$
$= -19(0{,}7753)$
$= -14{,}7307$ kN/m'

⇒ kondisi 3

- Momen Positif

$y_1 = \frac{13{,}8 \cdot 4}{17{,}8} = 3{,}1011$

$y_6 = \frac{1{,}5 \cdot 13{,}8}{17{,}8} = 1{,}1629$

$M_F = P_3(y_1) + P_4(y_6)$
$= 15(3{,}1011) + 19(1{,}1629)$
$= 46{,}5165 + 22{,}0951$
$= 68{,}6116$ kN/m'

- Momen Negatif

$y_8 = \frac{1 \cdot 13{,}8}{17{,}8} = 0{,}7753$

$y_7 = \frac{0{,}15 \cdot 13{,}8}{17{,}8} = 0{,}3876$

$M_F = -P_3(y_8)$
$= -15(0{,}7753)$
$= -11{,}6295$
$= -11{,}6295$ kN/m'

* Momen Positif ($M_{F\,max}$) terjadi pada kondisi 1 = 143,7528 kN/m'

* Momen Negatif ($M_{F\,min}$) terjadi pada kondisi 1 = -15,506 kN/m'

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LEMBAR ASISTENSI TUGAS SEMESTER

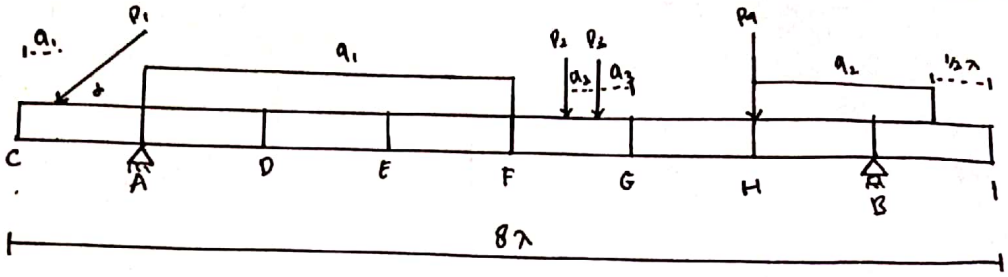
NAMA : **Denny Kurniawan**
NPM : **2255011002**
SEMESTER : **1 (Satu)**
MATA KULIAH : **STATIKA**

NO	TANGGAL	KETERANGAN	PARAF
1	26/9-2022	Perbaiki Perhitungan Lintang dan data beban	
2	27/9-2022	Perbaiki momen maksimum gambar grafik	
3	28/9-2022	NO 1a OK!. Lanjutkan 1b	
4.	5/10-2022	NO 1b OK!. Lanjutkan 1c	
5.	7/10-2022	Perhitungan lintang ekstrim OK! perbaiki penulisan Y. Tambahkan perhitungan momen ekstrim.	
6.	8/10-2022	Perbaiki Perhitungan yang keliru di momen ekstrem.	
7.	8/10-2022	NO 1c OK! ACC NO 1.	

Bandarlampung, 25 September 2022
Asisten Dosen

RYAN NATANAEL USWADI
NPM. 2015011007

Diketahui Struktur Simple Beam dengan beban tak langsung seperti tergambar.

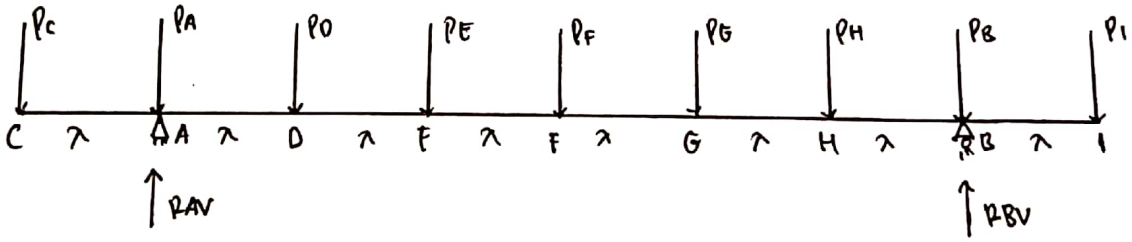


Data-data sebagai berikut

Perletakan		Beban		Jarak		Beban berjalan	
A	sendi	q_1	20 ton/m	λ	4,15 m	P5	45 ton
B	roi	q_2	10 ton/m	a_1	1,12 m	P6	45 ton
		P_1	25 ton	a_2	1,10 m	X1	
		P_2	30 ton	a_3	1,13 m		
		P_3	20 ton	d	60°		
		P_4	30 ton				
						X1	4,15 m

Pertanyaan :

a. Hitung dan gambarkan bidang momen, lintang, dan normal secara analitis akibat beban yang bekerja (seperti tergambar).



a. $P_1V = P_1 \cdot \sin d$
$= 25 \cdot \sin 60°$
$= 21,6506\ T$

$P_1H = P_1 \cdot \cos d$
$= 25 \cdot \cos 60°$
$= 12,5$

b. $P_C = \frac{\lambda - a_1}{\lambda} \cdot P_1V$
$= \frac{4,15 - 1,12}{4,15} \cdot 21,6506$
$= 15,8771\ T$

c. $P_A = \frac{a_1 \cdot P_1V}{\lambda} + \frac{\lambda \cdot q_1}{2}$
$= \frac{1,12 \cdot 21,6506}{4,15} + \frac{4,15 \cdot 20}{2}$
$= 5,7735 + 45$
$= 50,7735\ T$

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d. $P_D = \frac{\lambda \cdot q_1}{2} + \frac{\lambda \cdot q_1}{2}$

$= \frac{4{,}5 \cdot 20}{2} + \frac{4{,}5 \cdot 20}{2}$

$= 45 + 45$

$= 90\ T$

e. $P_E = \frac{\lambda \cdot q_1}{2} + \frac{\lambda \cdot q_1}{2}$

$= \frac{4{,}5 \cdot 20}{2} + \frac{4{,}5 \cdot 20}{2}$

$= 45 + 45$

$= 90\ T$

f. $P_F = \frac{\lambda \cdot q_1}{2} + \frac{a_2 + a_3}{\lambda} \cdot P_2 + \frac{a_3}{\lambda} \cdot P_3$

$= \frac{4{,}5 \cdot 20}{2} + \frac{1 + 1{,}3}{4{,}5} \cdot 30 + \frac{1{,}3}{4{,}5} \cdot 20$

$= 45 + 15{,}3333 + 5{,}7778$

$= 66{,}1111\ T$

g. $P_G = \frac{\lambda - a_2 - a_3}{\lambda} \cdot P_2 + \frac{\lambda - a_3}{\lambda} \cdot P_3$

$= \frac{4{,}5 - 1 - 1{,}3}{4{,}5} \cdot 30 + \frac{4{,}5 - 1{,}3}{4{,}5} \cdot 20$

$= 14{,}6667 + 14{,}2222$

$= 28{,}8889$

h. $P_H = P_4 + \frac{\lambda \cdot q_2}{2}$

$= 30 + \frac{4{,}5 \cdot 10}{2}$

$= 52{,}5$

i. $P_B = \frac{\lambda \cdot q_1}{2} + \frac{3}{4} \cdot \frac{(\lambda \cdot q_1)}{2}$

$= \frac{4{,}5 \cdot 10}{2} + \frac{3}{4} \cdot \frac{(4{,}5 \cdot 10)}{2}$

$= 22{,}5 + 16{,}875$

$= 39{,}375\ T$

j. $P_1 = \frac{1}{4} \cdot \left(\frac{\lambda \cdot q_2}{2}\right)$

$= \frac{1}{4} \cdot \frac{(4{,}5 \cdot 10)}{2}$

$= 5{,}625\ T$

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- Reaksi Perletakan

$\Sigma MB = 0$

$RA(6\lambda) - PC(7\lambda) - PA(6\lambda) - PD(5\lambda) - PE(4\lambda) - P_F(3\lambda) - PG(2\lambda) - PH(\lambda) + P_1(\lambda)$

$RA(6\lambda) = PC(7\lambda) + PA(6\lambda) + PD(5\lambda) + PE(4\lambda) + P_F(3\lambda) + PG(2\lambda) + PH(\lambda) - P_1(\lambda)$

$\lambda(RA.6) = \lambda(7PC + 6PA + 5PD + 4PE + 3P_F + 2PG + PH - P_1)$

$RA.6 = 7(15,8771) + 6(50,7735) + 5(90) + 4(90) + 3(66,1111) + 2(28,8889) + 52,5 - 5,625$

$RA.6 = 111,1397 + 304,641 + 450 + 360 + 198,3333 + 57,7778 + 52,5 - 5,625$

$RA.6 = 1528,7668$

$RA = \frac{1528,7668}{6}$

$RA = 254,7945\ T$

$\Sigma MA = 0$

$-RB(6\lambda) + PC(\lambda) + PD(\lambda) + PE(2\lambda) + P_F(3\lambda) + PG(4\lambda) + PH(5\lambda) + PB(6\lambda) + P_1(7\lambda)$

$RB(6\lambda) = -PC(\lambda) + PD(\lambda) + PE(2\lambda) + P_F(3\lambda) + PG(4\lambda) + PH(5\lambda) + PB(6\lambda) + P_1(7\lambda)$

$\lambda(RB.6) = \lambda(-PC + PD + 2PE + 3P_F + 4PG + 5PH + 6PB + 7P_1)$

$RB.6 = -15,8771 + 90 + 2(90) + 3(66,1111) + 4(28,8889) + 5(52,5) + 6(39,375) + 7(5,625).$

$RB.6 = -15,8771 + 90 + 180 + 198,3333 + 115,5556 + 262,5 + 236,25 + 39,375$

$RB.6 = 1106,1368$

$RB = \frac{1106,1368}{6}$

$RB = 184,3561\ T$

- Checking

$\Sigma V = 0$

$RA + RB = PC + PA + PD + PE + P_F + PG + PH + PB + P_1$

$254,7945 + 184,3561 = 15,8771 + 50,7735 + 90 + 90 + 66,1111 + 28,8889 + 52,5 + 39,375 + 5,625.$

$439,1506 = 439,1506$

$0 = 0$ OK!

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$\Sigma H = 0$

$HB - P_1H = 0$

$HB = P_1H$

$HB = 12{,}5\ T$

- Bidang Normal

$NP_1H - B = 12{,}5\ T$ (TARIK)

- Bidang Lintang

1. $D_{C-A\ kiri} = -P_C = -15{,}8771\ T$
2. $D_{A-D\ kiri} = -P_C - P_A + R_A = -15{,}8771 - 50{,}7735 + 254{,}7945.$
   $= 188{,}1439\ T$
3. $D_{D-E\ kiri} = -P_C - P_A + R_A - P_D$
   $= -15{,}8771 - 50{,}7735 + 254{,}7945 - 90$
   $= 98{,}1439\ T$
4. $D_{E-F\ kiri} = -P_C - P_A + R_A - P_D - P_E$
   $= -15{,}8771 - 50{,}7735 + 254{,}7945 - 90 - 90.$
   $= 8{,}1439\ T$
5. $D_{F-G\ kiri} = -P_C - P_A + R_A - P_D - P_E - P_F$
   $= -15{,}8771 - 50{,}7735 + 254{,}7945 - 90 - 90 - 66{,}1111.$
   $= -57{,}9672\ T$
6. $D_{G-H\ kiri} = -P_C - P_A + R_A - P_D - P_E - P_F - P_G$
   $= -15{,}8771 - 50{,}7735 + 254{,}7945 - 90 - 90 - 66{,}1111 - 28{,}8889$
   $= -86{,}8561\ T$
7. $D_{H-B\ kiri} = -P_C - P_A + R_A - P_D - P_E - P_F - P_G - P_H$
   $= -15{,}8771 - 50{,}7735 + 254{,}7945 - 90 - 90 - 66{,}1111 - 28{,}8889 - 52{,}5$
   $= -139{,}3561\ T$
8. $D_{B-1\ kiri} = -P_C - P_A + R_A - P_D - P_E - P_F - P_G - P_H - P_B + R_B$
   $= -15{,}8771 - 50{,}7735 + 254{,}7945 - 90 - 90 - 66{,}1111 - 28{,}8889 - 52{,}5 -$
   $39{,}375 + 184{,}3561$
   $= 5{,}625\ T$
9. $D_1 = -P_C - P_A + R_A - P_D - P_E - P_F - P_G - P_H - P_B + R_B - P_1$
   $= -15{,}8771 - 50{,}7735 + 254{,}7945 - 90 - 90 - 66{,}1111 - 28{,}8889 - 52{,}5 -$
   $39{,}375 + 184{,}3561 - 5{,}625$
   $= 0\ T$

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- Bidang Momen

1. $M_C = 0$ TM

2. $M_A = -P_C \cdot \lambda$
$= -15,8771 \cdot 4,5$
$= -71,4469$ TM

3. $M_D = -P_C(2\lambda) + P_A(\lambda) - P_A(\lambda)$
$= -15,8771(9) + 254,7945(4,5) - (50,7735(4,5)$
$= 775,2006$ TM.

4. $M_E = -P_C(3\lambda) + P_A(2\lambda) + P_A(2\lambda) - P_D(\lambda)$
$= -15,8771(13,5) + 50,7735(9) + 254,7945(9) - 90(4,5)$
$= 1216,8481$ TM

5. $M_F = -P_C(4\lambda) - P_A(3\lambda) + P_A(3\lambda) - P_D(2\lambda) - P_E(\lambda)$
$= -15,8771(18) - 50,7735(13,5) + 254,7945(13,5) - 90(9) - 90(4,5)$
$= 1253,4957$ TM.

6. $M_G = -P_C(5\lambda) - P_A(4\lambda) + P_A(4\lambda) - P_D(3\lambda) - P_E(2\lambda) - P_F(\lambda)$
$= -15,8771(22,5) - 50,7735(18) + 254,7945(18) - 90(13,5) - 90(9) -$
$66,1111(4,5)$
$= 992,6433$ TM.

7. $M_H = -P_C(6\lambda) - P_A(5\lambda) + P_A(5\lambda) - P_D(4\lambda) - P_E(3\lambda) - P_F(2\lambda) - P_G(\lambda)$
$= -15,8771(27) - 50,7735(22,5) + 254,7945(22,5) - 90(18) - 90(13,5) -$
$66,1111(9) - 28,8889(4,5)$
$= 601,7908$ TM

8. $M_B = -P_1 \cdot \lambda$
$= 5,625 \cdot 4,5$
$= -25,3125$ TM

9. $M_1 = 0$ TM.

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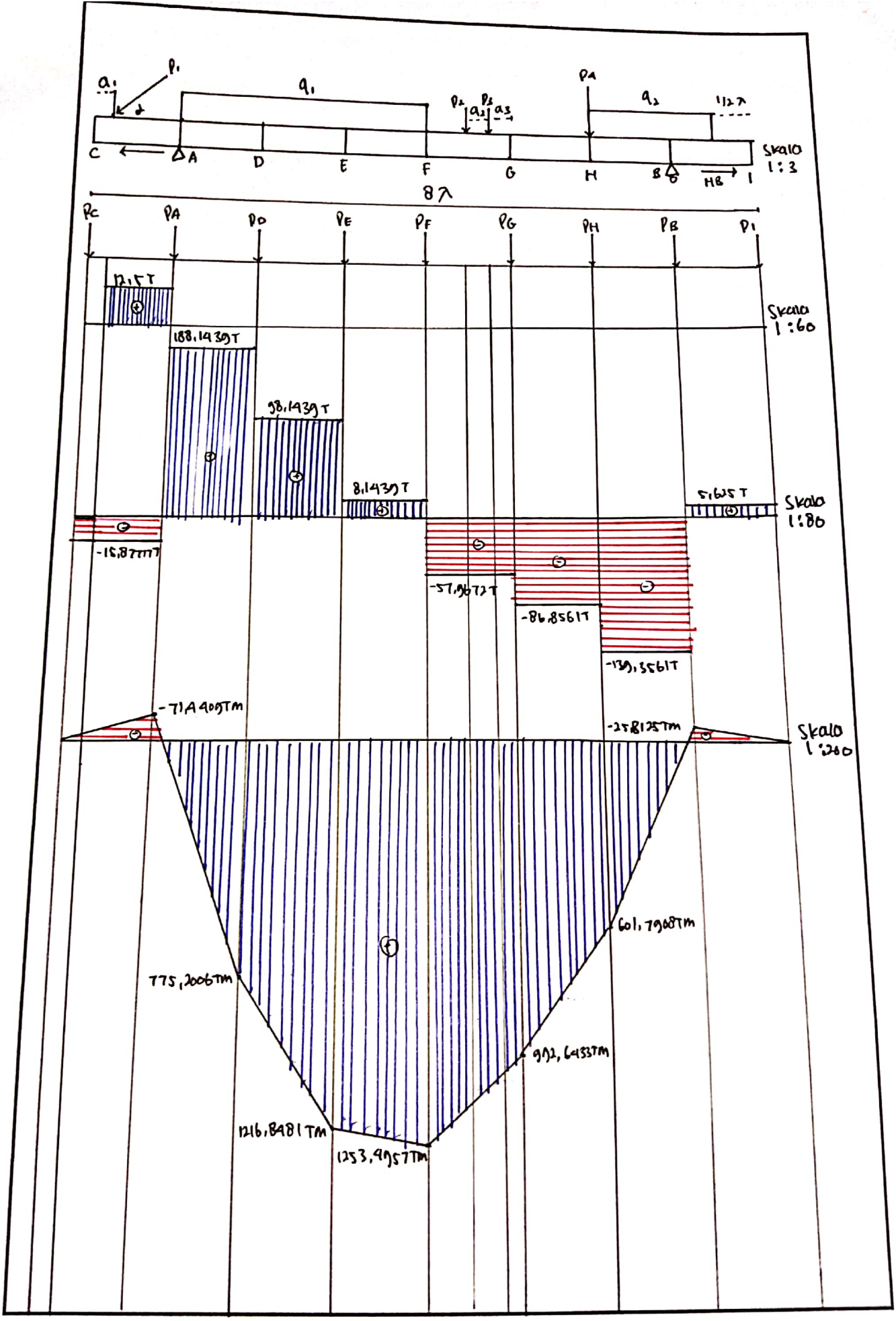

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b. Hitung dan gambar garis pengaruh momen dan lintang akibat beban jika P=1 Ton bergerak dari tumpuan A ke B pada Potongan/ titik D, G dan 0,7m ke kanan dari titik F.

- Potongan / Titik D

⊙ Lintang

•) $Y_1 = \frac{6\lambda - \lambda}{6\lambda} = \frac{6(4{,}5) - 4{,}5}{6(4{,}5)} = \frac{22{,}5}{27} = 0{,}8333$

•) $Y_2 = \frac{-\lambda}{6\lambda} = \frac{-4{,}5}{6(4{,}5)} = \frac{-4{,}5}{27} = -0{,}1667$

•) $Y_3 = \frac{-\lambda}{6\lambda} = \frac{-4{,}5}{6(4{,}5)} = \frac{-4{,}5}{27} = -0{,}1667$

•) $Y_4 = \frac{\lambda}{6\lambda} = \frac{4{,}5}{6(4{,}5)} = \frac{4{,}5}{27} = 0{,}1667$

⊙ Momen

•) $Y_0 = \frac{\lambda(6\lambda - \lambda)}{6\lambda} = \frac{4{,}5(6(4{,}5) - 4{,}5)}{6(4{,}5)} = \frac{4{,}5 \times 22{,}5}{27} = 3{,}75$

•) $Y_5 = \frac{-\lambda(5\lambda)}{6\lambda} = \frac{-4{,}5(5(4{,}5))}{6(4{,}5)} = \frac{-4{,}5 \times 22{,}5}{27} = -3{,}75$

•) $Y_6 = \frac{-\lambda(\lambda)}{6\lambda} = \frac{-4{,}5 \times 4{,}5}{6(4{,}5)} = \frac{-4{,}5 \times 4{,}5}{27} = -0{,}75$

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- Potongan / Titik G

⊙ Lintang

•) $Y_1 = \frac{6\lambda - 4\lambda}{6\lambda} = \frac{6(4{,}5) - 4(4{,}5)}{6(4{,}5)} = \frac{27 - 18}{27} = \frac{9}{27} = 0{,}3333$

•) $Y_2 = \frac{-4\lambda}{6\lambda} = \frac{-4(4{,}5)}{6(4{,}5)} = \frac{-18}{27} = -0{,}6667$

•) $Y_3 = \frac{-\lambda}{6\lambda} = \frac{-4{,}5}{6(4{,}5)} = \frac{-4{,}5}{27} = -0{,}1667$

•) $Y_4 = \frac{\lambda}{6\lambda} = \frac{4{,}5}{6(4{,}5)} = \frac{4{,}5}{27} = 0{,}1667$

⊙ Momen

•) $Y_6 = \frac{4\lambda(6\lambda - 4\lambda)}{6\lambda} = \frac{4(4{,}5)\,(6(4{,}5) - 4(4{,}5))}{6(4{,}5)} = \frac{18 \times 9}{27} = 6$

•) $Y_5 = \frac{-\lambda\,(2\lambda)}{6\lambda} = \frac{-4{,}5\,(2(4{,}5))}{6(4{,}5)} = \frac{-4{,}5 \times 9}{27} = -1{,}5$

•) $Y_6 = \frac{-\lambda(4\lambda)}{6\lambda} = \frac{-4{,}5\,(4(4{,}5))}{6(4{,}5)} = \frac{-4{,}5 \times 18}{27} = -3$

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- Potongan / Titik F

⊙ Lintang

•) $Y_1 = \frac{-3\lambda}{6\lambda} = \frac{-3(4{,}5)}{6(4{,}5)} = \frac{-13{,}5}{27} = -0{,}5$

•) $Y_2 = \frac{2\lambda}{6\lambda} = \frac{2(4{,}5)}{6(4{,}5)} = \frac{9}{27} = 0{,}3333.$

•) $Y_3 = \frac{-\lambda}{6\lambda} = \frac{-4{,}5}{6(4{,}5)} = \frac{-4{,}5}{27} = -0{,}1667$

•) $Y_4 = \frac{\lambda}{6\lambda} = \frac{4{,}5}{6(4{,}5)} = \frac{4{,}5}{27} = 0{,}1667$

⊙ Momen

•) $Y_F = \frac{3\lambda}{6\lambda} \times (3\lambda - 0{,}7) = \frac{3(4{,}5)}{6(4{,}5)} \times (3(4{,}5) - 0{,}7) = 0{,}5 \times 12{,}8 = 6{,}4$

•) $Y_G = \frac{2\lambda}{6\lambda} \times (3\lambda + 0{,}7) = \frac{2(4{,}5)}{6(4{,}5)} \times (3(4{,}5) + 0{,}7) = 0{,}3333 \times 14{,}2 = 4{,}7329$

•) $Y_F - Y_G = 6{,}4 - 4{,}7329 = 1{,}6671$

•) $Y' = \frac{(\lambda - 0{,}7)(Y_F - Y_G)}{\lambda} = \frac{(4{,}5 - 0{,}7)(1{,}6671)}{4{,}5} = \frac{3{,}8 \times 1{,}6671}{4{,}5} = 1{,}4077$

•) $Y_5 = \frac{-\lambda}{6\lambda} \times (3\lambda - 0{,}7) = \frac{-4{,}5}{6(4{,}5)} \times (3(4{,}5) - 0{,}7) = -0{,}1667 \times 12{,}8 = -2{,}1338$

•) $Y_6 = \frac{-\lambda}{6\lambda} \times (3\lambda + 0{,}7) = \frac{-4{,}5}{6(4{,}5)} \times (3(4{,}5) + 0{,}7) = -0{,}1667 \times 14{,}2 = -2{,}3671$

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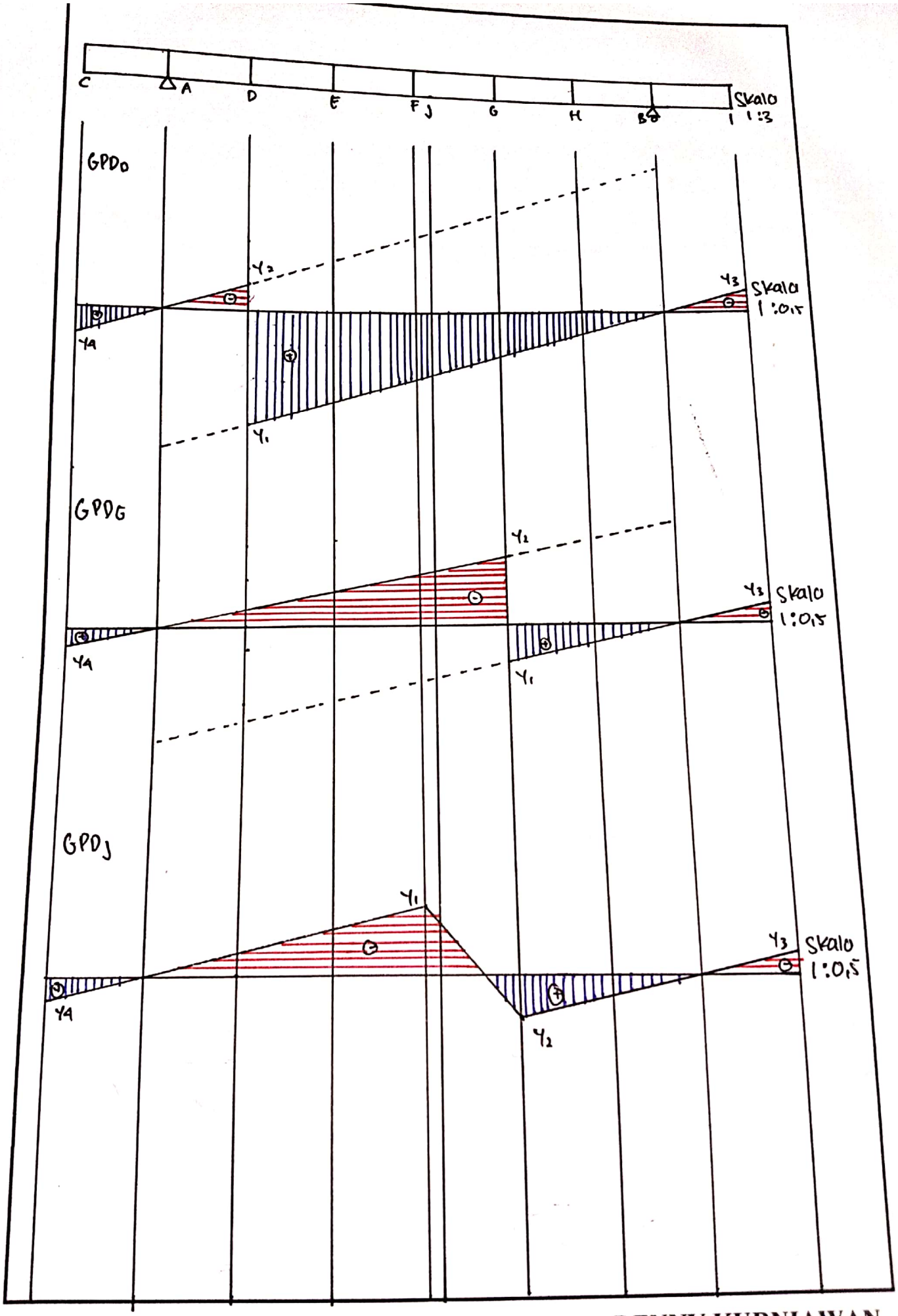

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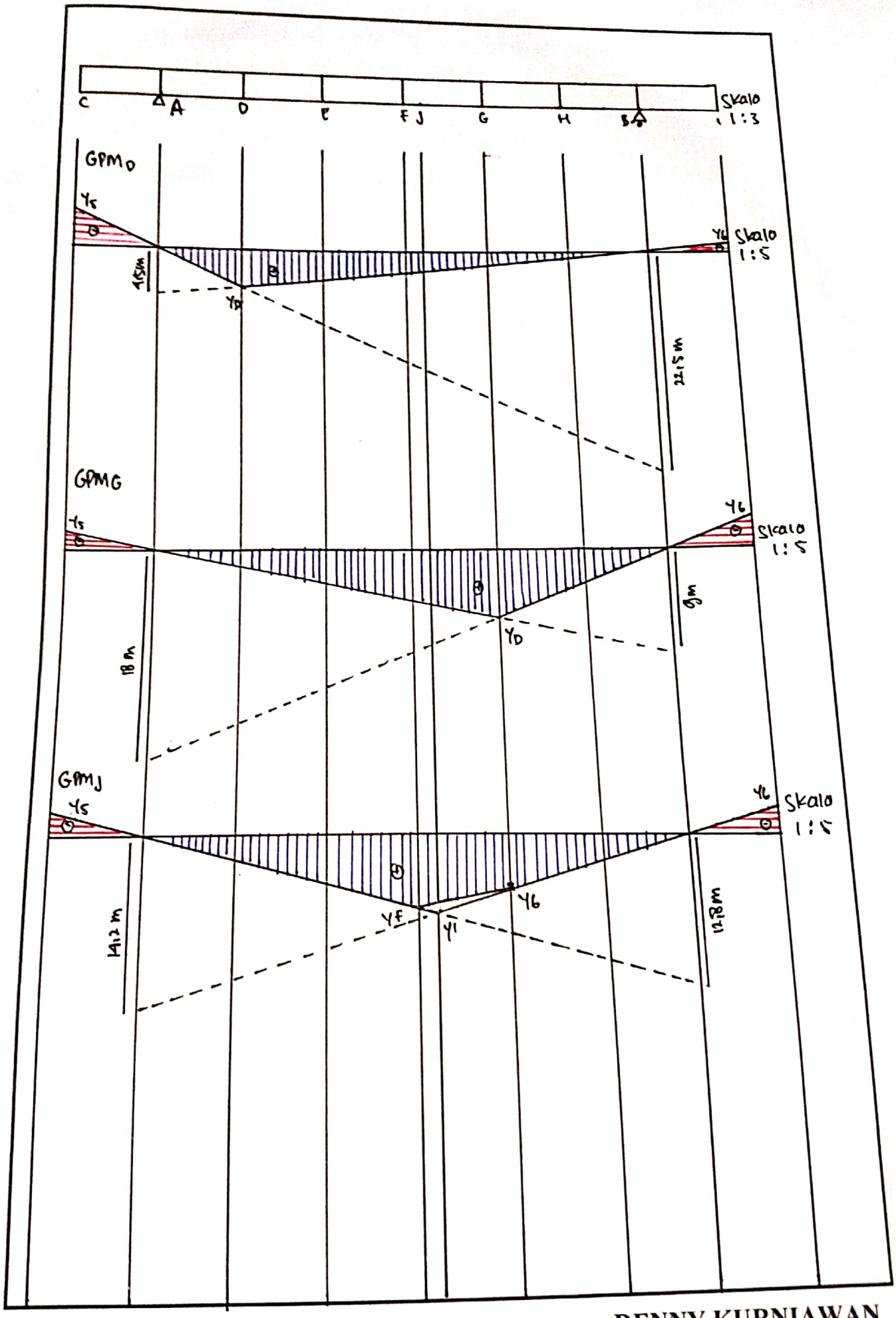

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C. Hitung besar momen ekstrim dan lintang ekstrim pada point (b) akibat rangkaian beban berjalan (P5, P6) dari A ke B.

Perpotongan Lintang Ekstrim

a. Titik D.

↳ $y_1 = \frac{\lambda - x_1}{6\lambda} = \frac{4{,}5 - 4{,}5}{6(4{,}5)} \cdot \frac{0}{27} = 0$

$y_2 = \frac{\lambda}{6\lambda} = \frac{4{,}5}{6(4{,}5)} = \frac{4{,}5}{27} = 0{,}1667$

$y_3 = \frac{5\lambda}{6\lambda} = \frac{5(4{,}5)}{6(4{,}5)} = \frac{22{,}5}{27} = 0{,}8333$

$y_4 = \frac{5\lambda - x_1}{6\lambda} = \frac{5(4{,}5) - 4{,}5}{6(4{,}5)} = \frac{22{,}5 - 4{,}5}{27} = \frac{18}{27} = 0{,}6667$

↳ Do Negatif

kondisi 1 $= -y_1 \cdot P5 - y_2 \cdot P6$
$= -0(45) - 0{,}1667(45) = -7{,}5015$ T

kondisi 2 $= -y_2 \cdot P5 = -0{,}1667(45) = -7{,}5015$ T

↳ Do Positif

kondisi 1 $= y_3 \cdot P6 = 0{,}8333(45) = 37{,}4985$ T

kondisi 2 $= y_3 \cdot P5 + y_4 \cdot P6$
$= 0{,}8333 \cdot 45 + 0{,}6667 \cdot 45 = 67{,}5$ T

Do Max terjadi pada kondisi 2 : 67,5 T

Do Min terjadi pada kondisi 1 dan 2 = −7,5015 T

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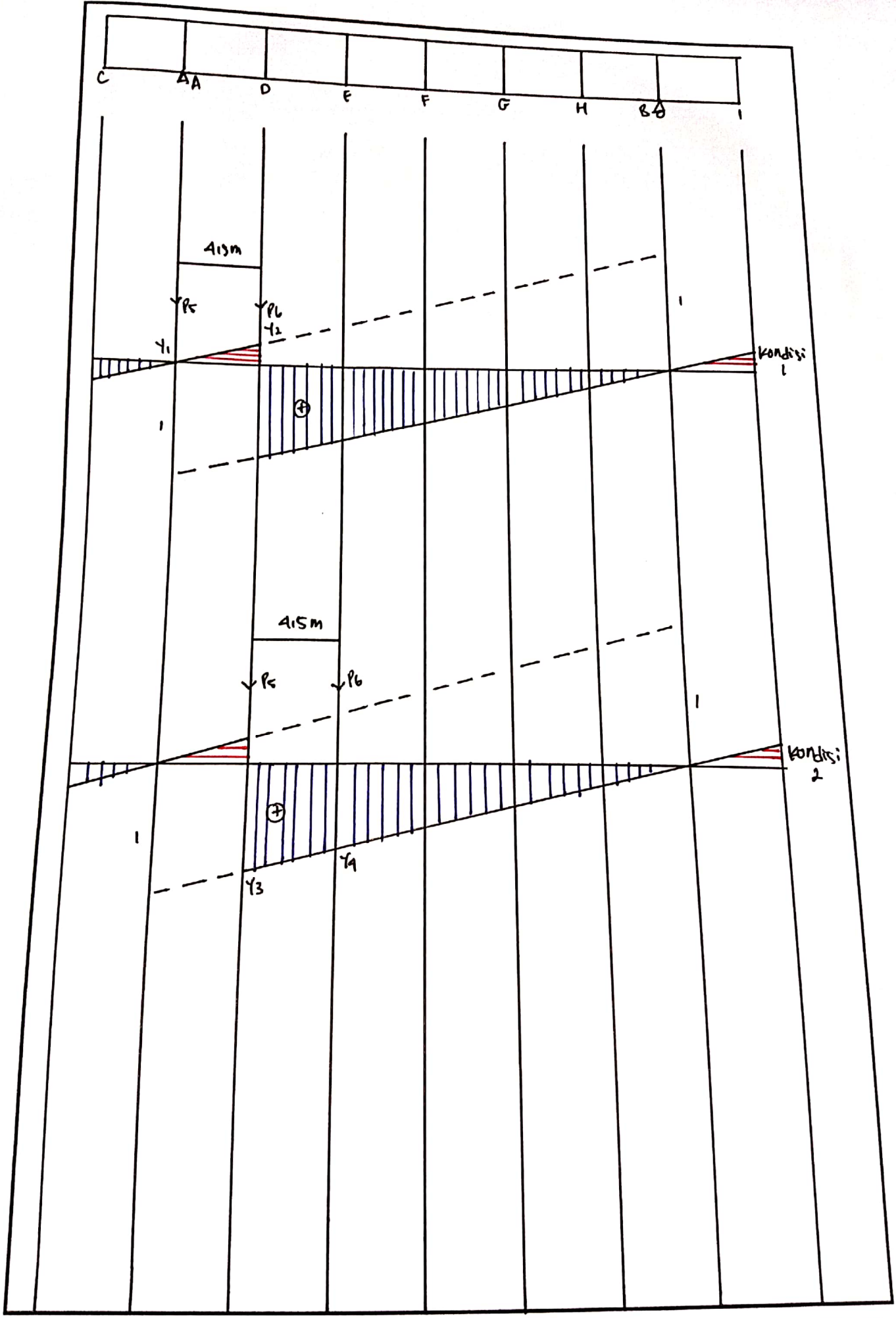

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b. Titik G

↳ $y_1 = \frac{4\pi - x_1}{6\pi} = \frac{4(9{,}15) - 9{,}15}{6(9{,}15)} = 0{,}5$

$y_2 = \frac{4\pi}{6\pi} = \frac{4(9{,}15)}{6(9{,}15)} = 0{,}16667$

$y_3 = \frac{2\pi}{6\pi} = \frac{2(9{,}15)}{6(9{,}15)} = 0{,}3333$

$y_4 = \frac{2\pi - x_1}{6\pi} = \frac{2(9{,}15) - 9{,}15}{6(9{,}15)} = 0{,}1667$

↳ DG Negatif

kondisi 1 $= -y_1 \cdot P_5 - y_2 \cdot P_6$

$= -0{,}5(45) - 0{,}16667(45) = -52{,}5015$ T

kondisi 2 $= -y_2 \cdot P_5 = -0{,}16667(45) = -30{,}0015$ T

↳ DG Positif

kondisi 1 $= y_3 \cdot P_6 = 0{,}3333 \cdot 45 = 14{,}9985$ T

kondisi 2 $= y_3 \cdot P_5 + y_4 \cdot P_6$

$= 0{,}3333 \cdot 45 + 0{,}1667 \cdot 45 = 22{,}5$ T

DG Max terjadi pada kondisi 2 = 22,5 T

DG Min terjadi pada kondisi 1 = -52,5015 T

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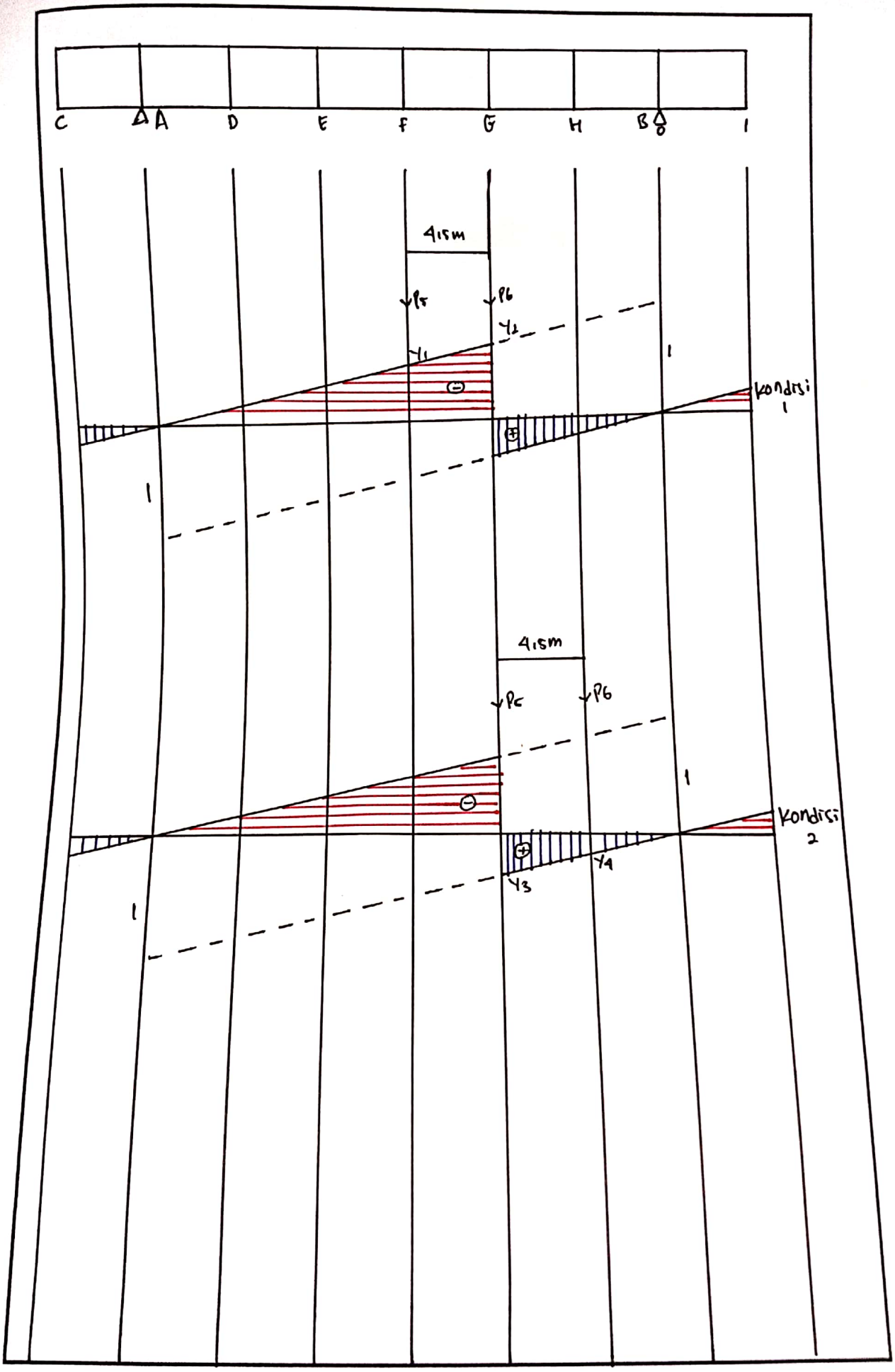

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C. Titik F

↳ $y_1 = \frac{3x - x_1}{6x} = \frac{3(4,5) - 4,5}{6(4,5)} = 0,13333.$

$y_2 = \frac{3x}{6x} = \frac{3(4,5)}{6(4,5)} = 0,5$

$y_3 = \frac{2x}{6x} = \frac{2(4,5)}{6(4,5)} = 0,13233$

$y_4 = \frac{x}{6x} = \frac{4,5}{6(4,5)} = 0,11667$

↳ DF Negatif

Kondisi 1 $= -y_1 \cdot P_5 - y_2 \cdot P_6$

$= -0,13333 \cdot 45 - 0,5 \cdot 45 = -37,4985$ T

Kondisi 2 $= -y_2 \cdot P_5 = 0,5 \cdot 45 = -22,5$ T

↳ DF Positif

Kondisi 1 $= P_6 \cdot y_3 = 45 \cdot 0,13333 = 14,9985$ T

Kondisi 2 $= y_3 \cdot P_5 + y_4 \cdot P_6$

$= 0,13333 \cdot 45 + 0,1667 \cdot 45 = 22,5$ T

DF max terjadi pada kondisi 2 = 22,5 T

DF min terjadi pada kondisi 1 = -37,4985 T.

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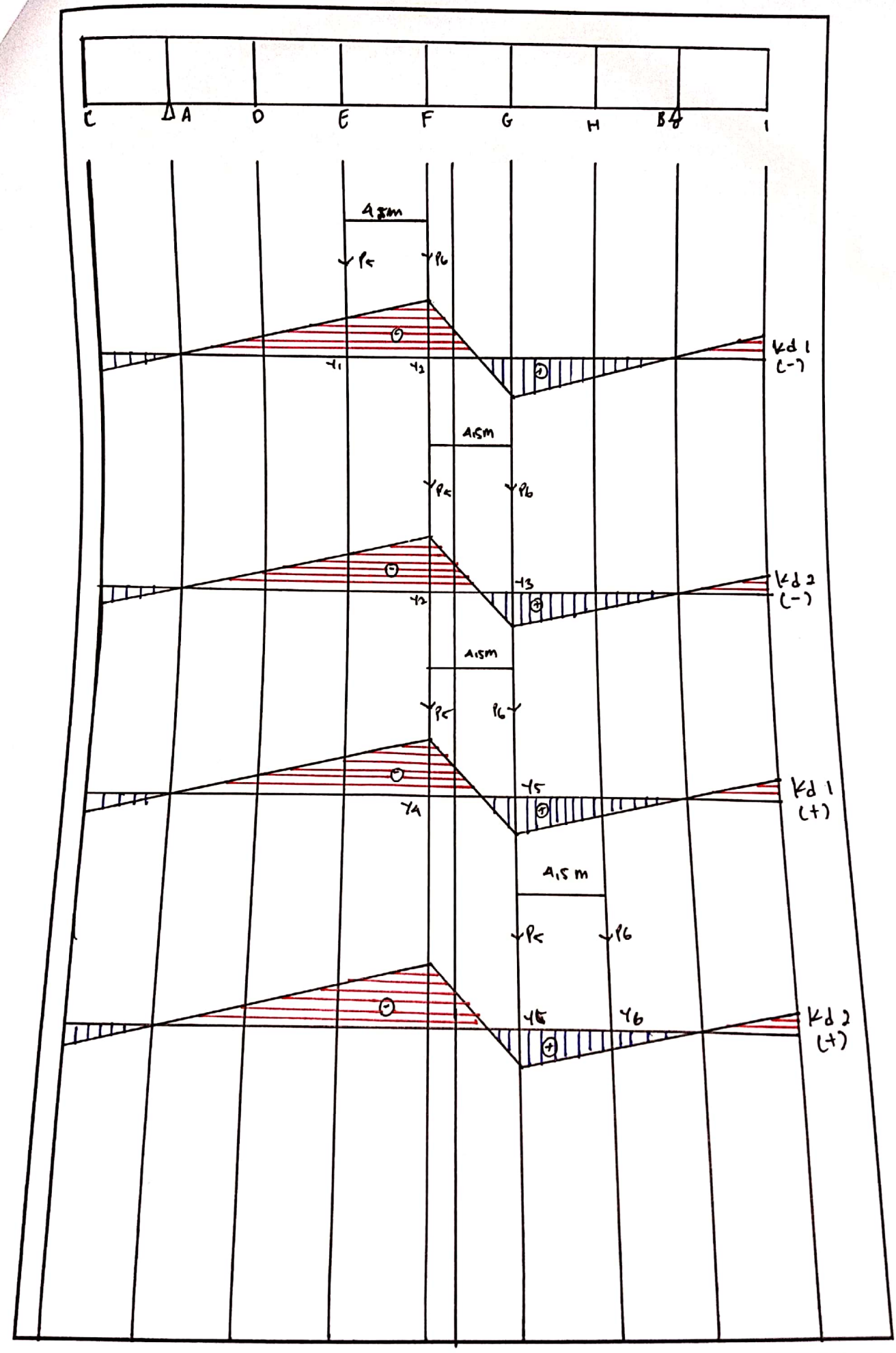

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Potongan Momen Ekstrim.

a. Titik D

↳ $y_1 = \frac{\lambda \cdot 5\lambda}{6\lambda} = \frac{4{,}5 \cdot 5(4{,}5)}{6(4{,}5)} = 3{,}75$

$y_2 = \frac{(\lambda - x_1)5\lambda}{6\lambda} = \frac{(4{,}5 - 4{,}5)\,5(4{,}5)}{6(4{,}5)} = 0$

$y_3 = \frac{\lambda \cdot 5\lambda}{6\lambda} = \frac{4{,}5 \cdot 5(4{,}5)}{6(4{,}5)} = 3{,}75$

$y_4 = \frac{(5\lambda - x_1)\lambda}{6\lambda} = \frac{(5 \cdot 4{,}5 - 4{,}5)\,4{,}5}{6(4{,}5)} = 3.$

↳ MD Negatif

Kondisi 1 = $-y_1 \cdot P_6 = -3{,}75 \cdot 45 = -168{,}75$ Tm.

↳ MD Positif

Kondisi 2 = $y_3 \cdot P_6 = 3{,}75 \cdot 45 = 168{,}75$ Tm

Kondisi 3 = $y_3 \cdot P_5 + y_4 \cdot P_6$

$= 3{,}75 \cdot 45 + 3 \cdot 45 = 303{,}75$ Tm.

MD max terjadi pada kondisi 3 = 303,75 Tm.

MD min terjadi pada kondisi 1 = -168,75 Tm.

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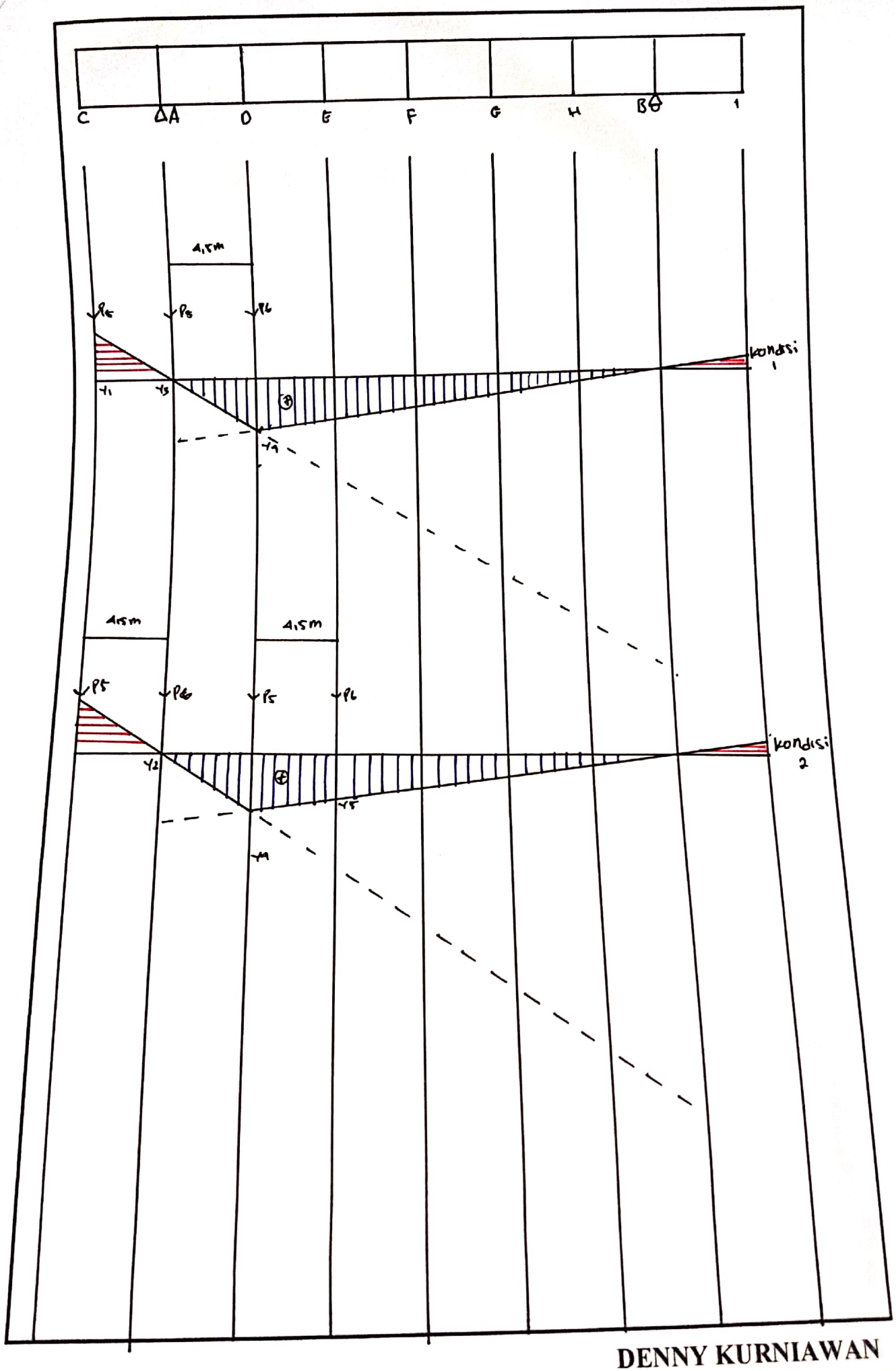

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b. Titik G

↳ $y_1 = \frac{7\lambda \cdot 2\lambda}{6\lambda} = \frac{4{,}15 \cdot 2(4{,}15)}{6(4{,}15)} = 1{,}15$

$y_2 = \frac{(7\lambda - x_1)\,2\lambda}{6\lambda} = \frac{(4{,}15 - 4{,}15)\,2(4{,}15)}{6(4{,}15)} = 0$

$y_3 = \frac{4\lambda \cdot 2\lambda}{6\lambda} = \frac{4(4{,}15) \cdot 2(4{,}15)}{6(4{,}15)} = 6$

$y_4 = \frac{7\lambda \cdot 5\lambda}{6\lambda} = \frac{4{,}15 \cdot 5(4{,}15)}{6(4{,}15)} = 3{,}75.$

$y_5 = \frac{3\lambda \cdot 2\lambda}{6\lambda} = \frac{3(4{,}15) \cdot 2(4{,}15)}{6(4{,}15)} = 4{,}15$

↳ MG Negatif

kondisi 1 $= -y_1 \cdot P_6 = -1{,}15 \cdot 45 = -67{,}5$ TM.

↳ MG Positif

kondisi 2 $= y_3 \cdot P_5 + y_4 \cdot P_6$
$= 6 \cdot 45 + 4{,}15 \cdot 45 = 472{,}5$ TM

kondisi 3 $= y_3 \cdot P_5 + y_4 \cdot P_6$
$= 6 \cdot 45 + 3{,}75 \cdot 45 = 438{,}75$ TM.

Mo max terjadi pada kondisi 2 = 472,5 TM

Mo min terjadi pada kondisi 1 = -67,5 TM.

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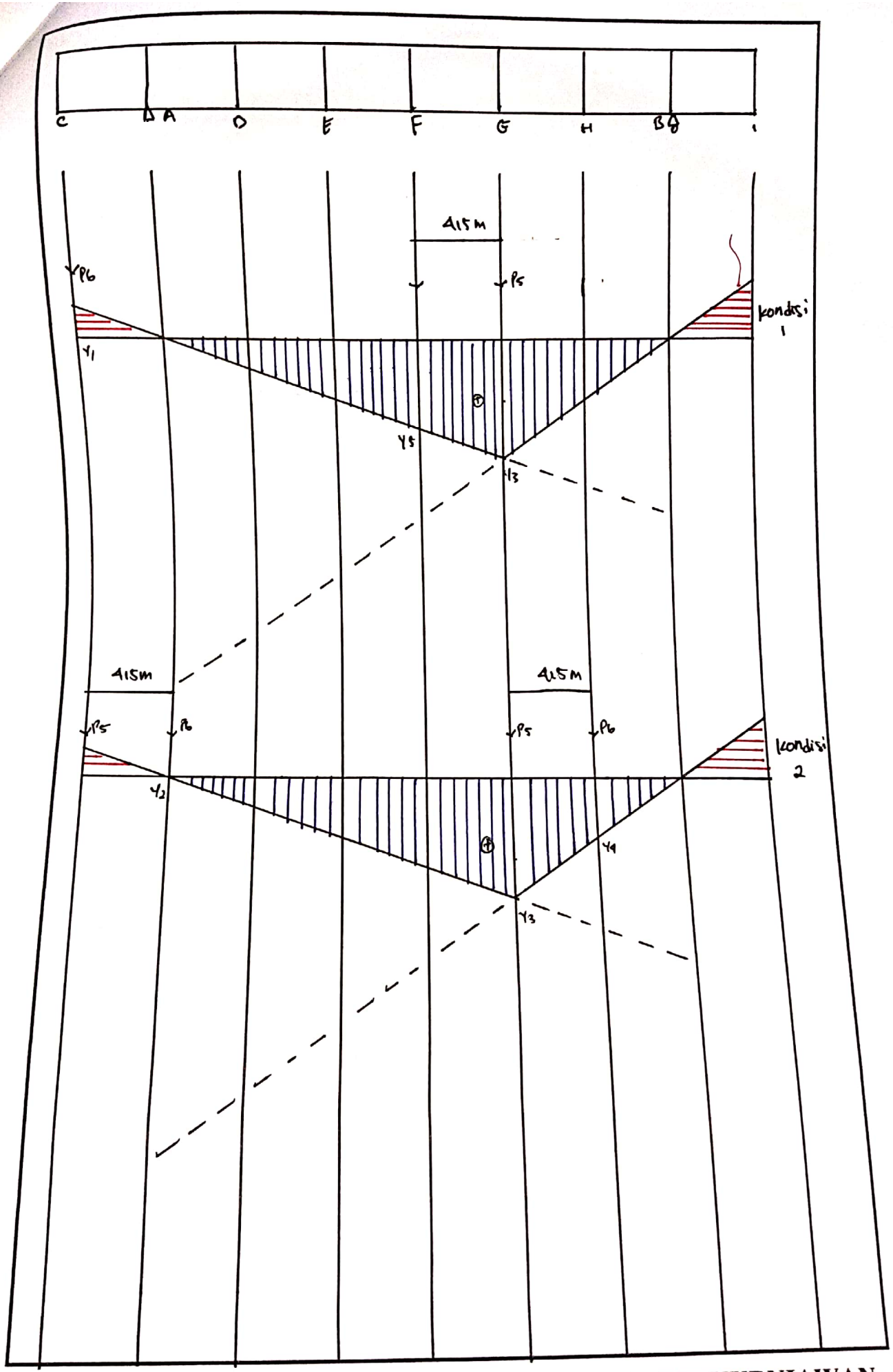

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C. Titik 5

- $y_1 = \frac{(3\lambda - x_1)(3\lambda - 0{,}17)}{6\lambda} \cdot \frac{(3 \cdot 4{,}15 - 4{,}15)(3 \cdot 4{,}15 - 0{,}17)}{6(4{,}15)} = 4{,}2667.$

$y_2 = \frac{(3\lambda)(3\lambda - 0{,}17)}{6\lambda} = \frac{(3 \cdot 4{,}15)(3 \cdot 4{,}15 - 0{,}17)}{6(4{,}15)} = 6{,}4.$

$y_3 = \frac{(2\lambda)(3\lambda + 0{,}17)}{6\lambda} = \frac{2(4{,}15)(3 \cdot 4{,}15 + 0{,}17)}{6(4{,}15)} = 4{,}7333$

$y_4 = \frac{(3\lambda + 0{,}17)(2\lambda - x_1)}{6\lambda} = \frac{(3(4{,}15) + 0{,}17)(2(4{,}15) - 4{,}15)}{6(4{,}15)} = 2{,}3667$

$y_5 = \frac{(3\lambda + 0{,}17)(\lambda - x_1)}{6\lambda} = \frac{(3(4{,}15) + 0{,}17)(4{,}15 + 4{,}15)}{6(4{,}15)} = 0$

$y_6 = \frac{(3\lambda + 0{,}17)(\lambda)}{6(\lambda)} = \frac{(3(4{,}15) + 0{,}17)(4{,}15)}{6(4{,}15)} = 2{,}3667.$

- MF Negatif

Kondisi 1 $= -y_6 \cdot P_6 = -2{,}3667 \cdot 45 = -106{,}5015$ TM.

Kondisi 2 $= -y_6 \cdot P_5 = -2{,}3667 \cdot 45 = -106{,}5015$ TM.

- MF Positif

Kondisi 1 $= y_1 \cdot P_5 + y_2 \cdot P_6$
$= 4{,}2667 \cdot 45 + 6{,}4 \cdot 45 = 480{,}0015$ TM.

Kondisi 2 $= y_2 \cdot P_5 + y_3 \cdot P_6$
$= 6{,}4 \cdot 45 + 4{,}7333 \cdot 45 = 500{,}9985$ TM.

Kondisi 3 $= y_2 \cdot P_5 + y_4 \cdot P_6$
$= 4{,}7333 \cdot 45 + 2{,}3667 \cdot 45 = 319{,}5$ TM.

MF max terjadi pada kondisi 2 = 500,9985 TM.

MF min terjadi pada kondisi 1 = -106,5015 TM.

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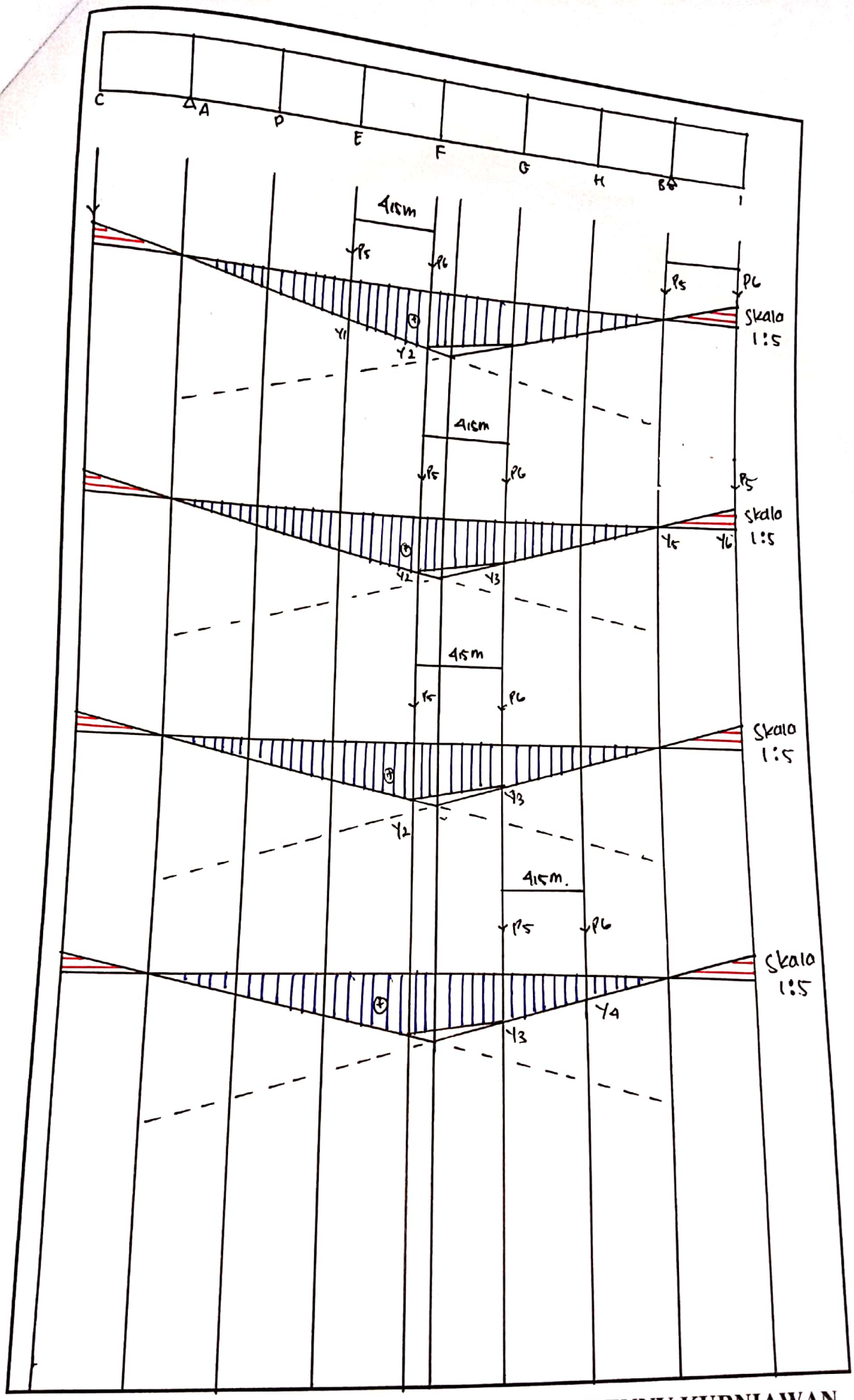

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KEMENTERIAN RISET, TEKNOLOGI DAN PENDIDIKAN TINGGI
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Telp./Fax. (0721) 702767 http: eng.unila.ac.id

LEMBAR ASISTENSI TUGAS SEMESTER

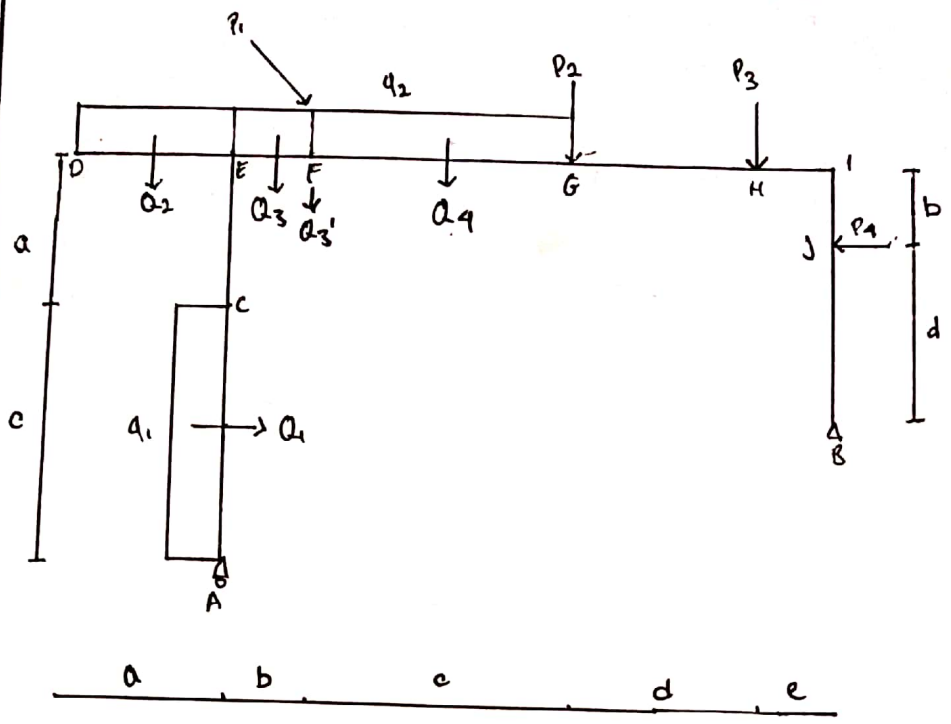
NAMA : **DENNY KURNIAWAN**
NPM : **2255011002**
SEMESTER : **1 (SATU)**
MATA KULIAH : **STATIKA**

NO	TANGGAL	KETERANGAN	PARAF
1	17/10 - 2022	Uraikan lintang. Perbaiki	
		gambar MDN, tambahkan	
		skala	
2.	18/10-2022	Perhitungan 2a OK ! Lanjutkan	
		perhitungan 2b	
3.	20/10- 2022	Perhitungan 2b OK ! Lanjutkan	
		perhitungan 2c.	
4.	28/10-2022	Perbaiki lintang dan momen	
		di titik 0,7 m dari F	
5.	29/10-2022	Perhitungan 2c OK !	
		ACC no 2	

Bandarlampung, 25 September 2022
Asisten Dosen

RYAN NATANAEL USWADI
NPM. 2015011007

Diketahui struktur Portal dengan beban seperti tergambar.



Data-data sebagai berikut :

Perletakan		Beban		Jarak	
A	ROl	q_1	3,8 ton/m	a	2 m
B	Sendi	q_2	4,2 ton/m	b	1 m
		P_1	2,9 ton	c	3,5 m
		P_2	2,5 ton	d	2,9 m
		P_3	1,7 ton	e	1 m
		P4	3 ton	sudut	27 ^{o}

Pertanyaan :

Hitung dan gambarkan bidang momen, lintang dan normal secara analitis.

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-. Diketahui:

$Q_1 = q_1 \cdot c$
$= 3{,}8 \cdot 3{,}3$
$= 12{,}54\ T$

$Q_2 = q_2 \cdot a$
$= 4{,}2 \cdot 2$
$= 8{,}4\ T$

$Q_3 = q_2 \cdot b$
$= 4{,}2 \cdot 1$
$= 4{,}2$

$Q_4 = q_2 \cdot c$
$= 4{,}2 \cdot 3{,}3$
$= 13{,}86\ T$

$Q_3' = q_2(b+c)$
$= 4{,}2 \cdot (4{,}3)$
$= 18{,}06\ T$

$P_1V = P_1 \cdot \sin 27$
$= 2{,}9 \cdot 0{,}4540$
$= 1{,}3166\ T$

$P_1H = P_1 \cdot \cos 27$
$= 2{,}9 \cdot 0{,}8910$
$= 2{,}5839\ T$

- Reaksi perletakan

$\Sigma H = 0$

$BH - P_4 + Q_1 + PH = 0$

$BH = P_4 - Q_1 - PH$

$= 3 - 12{,}54 - 2{,}5839 = -12{,}1239\ (\leftarrow)$

$\Sigma MB = 0$

$= RAV(b+c+d+e) + Q_1(Q_1'(b+d) - (a+c)) - Q_2(\frac{1}{2}a + b+c+d+e) - Q_3'(\frac{1}{2} \cdot (b+c) + d+e) + P_1H(b+d) - P_1V(c+d+e) - P_2(d+e) - P_3(e) - P_4(d) + RBH(0) = 0$

$= RAV(7{,}7) + 12{,}54(-0{,}25) - 8{,}4(8{,}7) - 18{,}06(5{,}55) + 2{,}5839(3{,}4) - 1{,}3166(6{,}7) - 2{,}5(3{,}4) - 1{,}7(1) - 3(2{,}4) + (-12{,}1239(1{,}9)) + 0 = 0$

$= RAV(7{,}7) - 3{,}1350 - 73{,}08 - 100{,}2330 + 8{,}7853 - 8{,}8212 - 8{,}5 - 1{,}7 - 7{,}2 = 0$

$= RAV(7{,}7) = 193{,}8839$

$RAV = 25{,}1797\ T$

$\Sigma MA = 0$

$= -RBV(b+c+d+e) + RBH((b+d) - (a+c)) - P_4((a+c) - b) + P_3(d+c+b) + P_2(b+c) + Q_3'(\frac{1}{2}(b+c)) + P_1H(a+c) + P_1V(b) - Q_2(\frac{1}{2}a) + Q_1(\frac{1}{2}c) = 0$

$= -RBV(7{,}7) + 12{,}1239(-1{,}9) - 3(4{,}3) + 1{,}7(6{,}7) + 2{,}5(4{,}3) + 18{,}06(2{,}5) + 2{,}5839(5{,}3) + 1{,}3166(1) - 8{,}4(1) + 12{,}54(1{,}65) = 0$

$= -RBV(7{,}7) - 23{,}0354 - 12{,}9 + 11{,}39 + 10{,}75 + 38{,}8200 + 13{,}6947 + 1{,}3166 - 8{,}4 + 20{,}6910 = 0$

$= -RBV(7{,}7) = -52{,}3359$

$RBV = 6{,}7969\ T$

$\Sigma V = 0$

$RAV + RBV = Q_2 + Q_3 + Q_4 + P_1V + P_2 + P_3$

$25{,}1797 + 6{,}7969 = 8{,}4 + 4{,}2 + 13{,}86 + 1{,}3166 + 2{,}5 + 1{,}7$

$31{,}9766 = 31{,}9766$

$0 = 0$ Ok!

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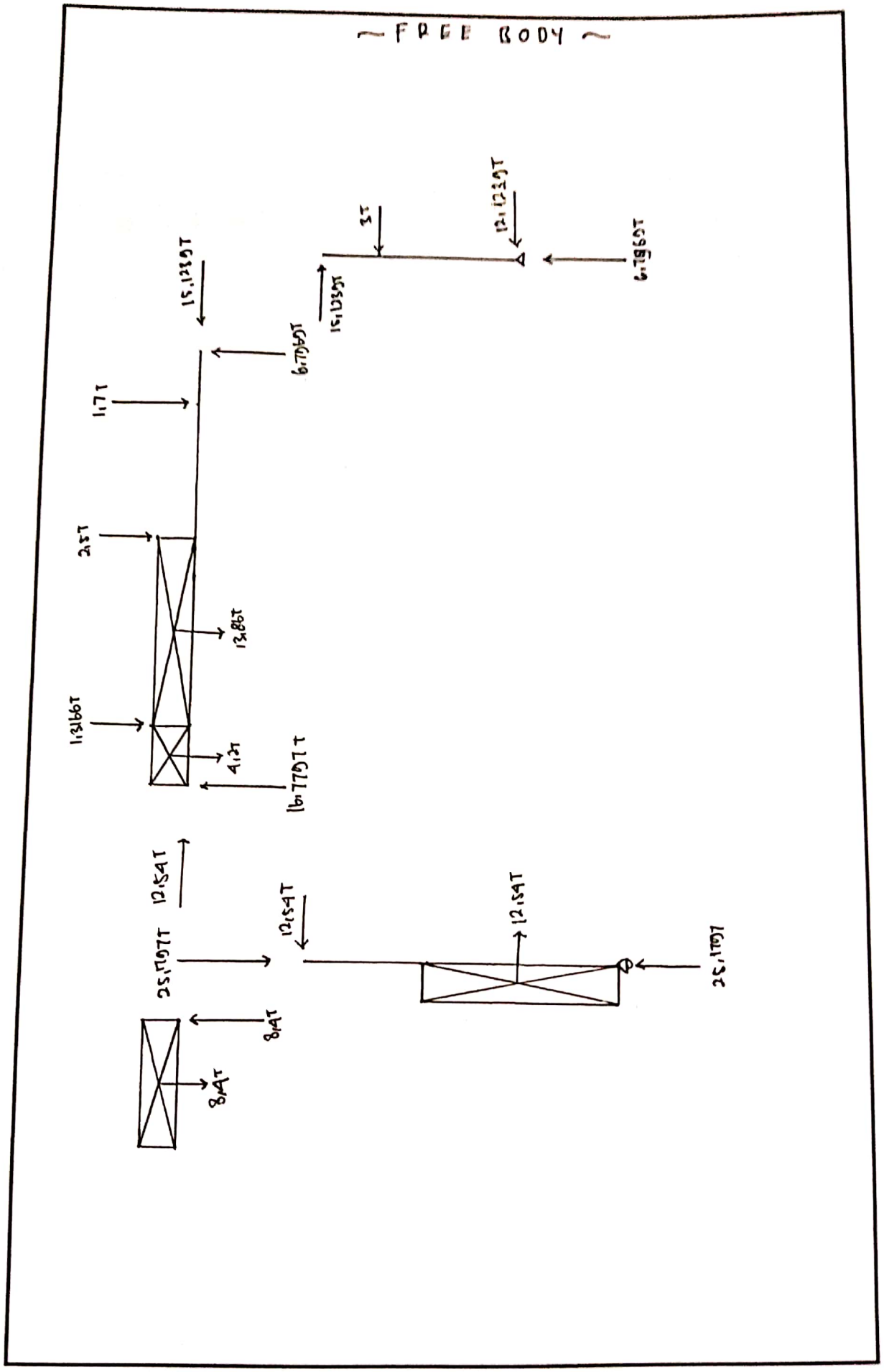

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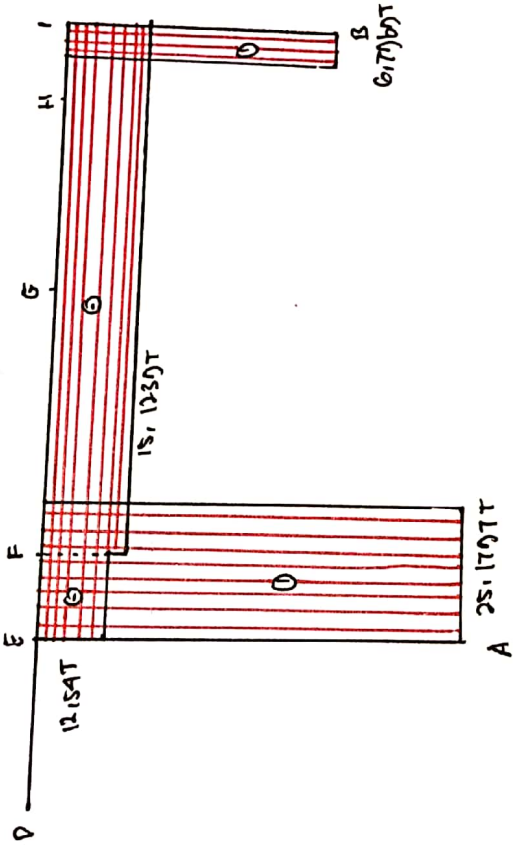
- Bidang Normal

•) N_{AE} = 25,1797 T

•) N_{EF} = 12,154 T

•) N_{FI} = 15,1239 T

•) N_{IB} = 6,7969 T



Skala Jarak 1:1

Skala Normal 1:15

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- Bidang Lintang

•) Bentang A-E

$D_A = 0T$

$D_C = -Q_1 = -12{,}154T$

$D_{C\ kanan} = -Q_1+Q_2 = -12{,}154+12{,}154 = 0T$

•) Bentang D-E

$D_D = 0T$

$D_E = -Q_2 = -8{,}14T$

$D_{E\ kanan} = -Q_2+Q_2 = -8{,}14+8{,}14 = 0T.$

•) Bentang E-I

$D_E = R_{AV}-Q_2 = 25{,}1797-8{,}14 = 16{,}7797T$

$D_{F\ kiri} = R_{AV}-Q_2-Q_3 = 25{,}1797-8{,}14-4{,}12 = 12{,}7797T$

$D_{F\ kanan} = R_{AV}-Q_2-Q_3-P_1V = 25{,}1797-8{,}14-4{,}12-1{,}3166 = 11{,}2631T$

$D_{G\ kiri} = R_{AV}-Q_2-Q_3-P_1V-Q_4 = 25{,}1797-8{,}14-4{,}12-1{,}3166-13{,}86$
$= -2{,}5969T$

$D_{G\ kanan} = R_{AV}-Q_2-Q_3-P_1V-Q_4-P_2 = 25{,}1797-8{,}14-4{,}12-1{,}3166-13{,}86-2{,}15$
$= -5{,}0969T$

$D_H = R_{AV}-Q_2-Q_3-P_1V-Q_4-P_2-P_3 = 25{,}1797-8{,}14-4{,}12-1{,}3166-13{,}86-2{,}15-1{,}7$
$= -6{,}7969T$

$D_I = R_{AV}-Q_2-Q_3-P_1V-Q_4-P_2-P_3+R_{BV}$
$= 25{,}1797-8{,}14-4{,}12-1{,}3166-13{,}86-2{,}15-1{,}7+6{,}7969$
$= 0T.$

•) Bentang I-B

$D_I = P_4' = 15{,}1239T$

$D_J = P_4'-P_4 = 15{,}1239-3 = 12{,}1239T$

$D_B = P_4'-P_4-R_{BH} = 15{,}1239-3-12{,}1239 = 0T.$

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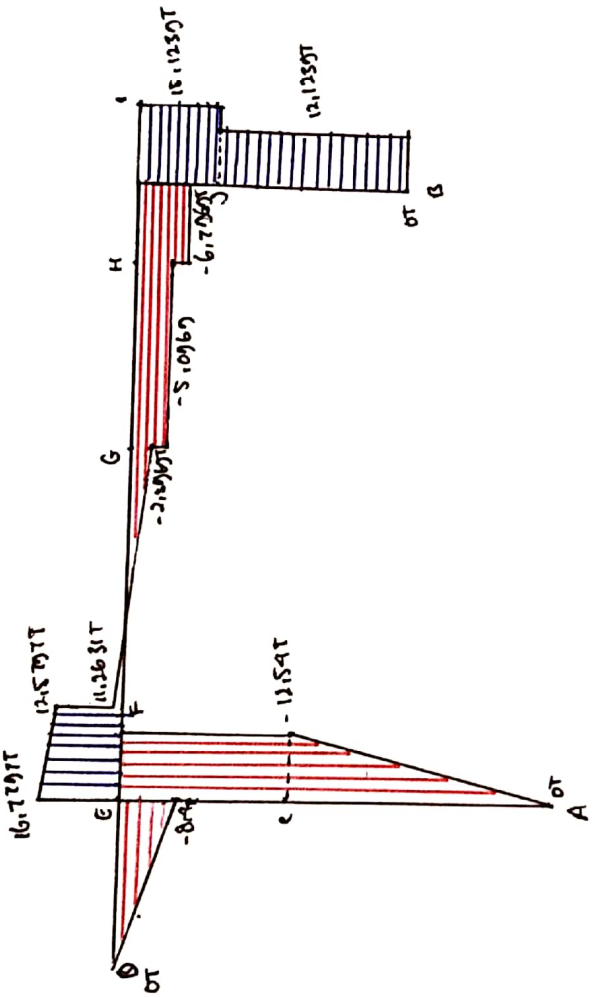
- Bidang Lintang



Skala Jarak 1 : 1

Skala Lintang 1 : 15

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- Bidang Momen

•) Bentang A-E

$M_A = 0\ TM$

$M_C = -Q_1.(1/2C) = -12,154.1,65 = -20,0610\ Tm$

$M_E = -Q_1.(1/2C+a) = -12,154.3,165 = -48,7710\ Tm.$

•) Bentang D-E

$M_D = 0\ TM.$

$M_B = -Q_2.(1/2a) = -8,14.1 = -8,14\ TM.$

•) Bentang E-I

$M_E = RBV.(b+c+d+e) + RBH(b+d) - P_4.b - P_3(b+c+d) - P_2(b+c) - P_1V(b) - Q_3'(\frac{b+c}{2})$

$= 6,7969(7,7) + 12,1239(3,9) - 3(1) - 1,7(6,7) - 2,5(4,5) - 1,3166(1) - 18,06(2,15)$

$= -54,1701\ TM.$

$M_F = -Q_1(1/2c+a) - Q_2(1/2a+b) + RAV(b) - Q_3(1/2b)$

$= -12,154(3,65) - 8,14(2) + 25,1797(1) - 4,12(0,5) = -39,4913\ TM.$

$M_G = -Q_1(1/2c+a) - Q_2(1/2a+b+c) + RAV(b+c) - Q_3'(1/2(b+c)) - P_1V(c)$

$= -12,154(3,65) - 8,14(5,3) + 25,1797(4,3) - 18,06(2,15) - 1,3166(3,3)$

$= -25,1021\ TM.$

$M_H = -Q_1(1/2c+a) - Q_2(1/2a+b+c+d) + RAV(b+c+d) - Q_3'(1/2(b+c)+d) - P_1V(c+d) - P_2(d)$

$= -12,154(3,65) - 8,14(7,7) + 25,1797(6,7) - 18,06(4,55) - 1,3166(5,7) - 2,3(2,4)$

$= -37,4246\ TM.$

$M_I = -Q_1(1/2c+a) - Q_2(1/2a+b+c+d+e) + RAV(b+c+d+e) - Q_3'(1/2(b+c)+d+e) - P_1V(c+d+e) - P_2(d+e) - P_3(e)$

$= -12,154(3,65) - 8,14(8,7) + 25,1797(7,7) - 18,06(5,5) - 2,5(3,4) - 1,7(1) - 1,3166(6,7)$

$= -44,2215\ TM.$

•) Bentang I-B

$M_B = 0\ TM$

$M_J = -RBH(d) = -12,1239(2,4) = -29,0974\ TM.$

$M_I = -RBH(b+d) - P_3.b$

$= -12,1239(3,9) - 1,7(1)$

$= -42,9213\ TM.$

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$$Mx = RAU(EF+x) - Q_1(1/2AC+CE) - Q_2(1/2DE+EF+x) - Q_3(1/2EF+x) - PV(x) - qx \cdot 1/2x^2$$

$$\downarrow$$

$$dx = 0$$

$$\frac{dMx}{dx} = RAU - Q_2 - Q_3 - PV - qx = 0$$

$$= 25,1797 - 8,14 - 4,12 - 1,3166 = qx$$

$$= 11,2631 = x \quad \text{Nilai } x = 2,6817$$

$$4,12 \text{ T/m}$$

$$Mx = 25,1797(1+2,6817) - 12,54(1,65+2) - 8,14(1+1+2,6817) - 4,12(0,5+2,6817) - 1,3166(2,6817) - \frac{4,12}{2}(2,6817)^2$$

$$= -24,3892 \text{ TM}.$$

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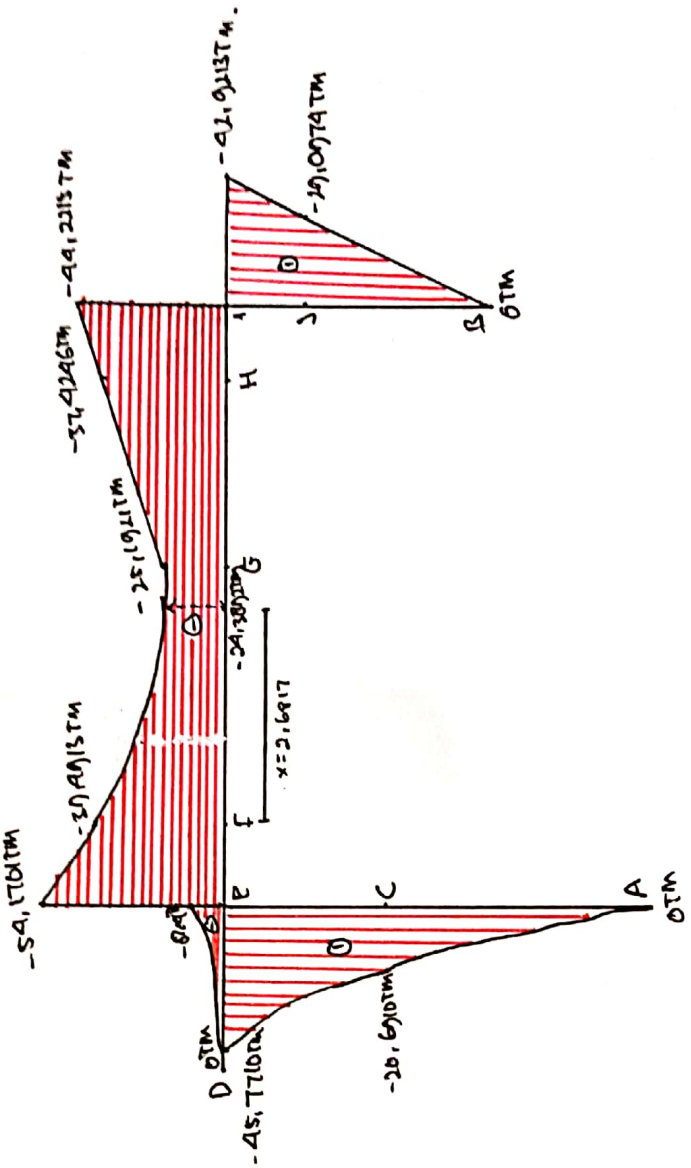
- Bidang Momen.



Skala Jarak 1 : 1

Skala Momen 1 : 25

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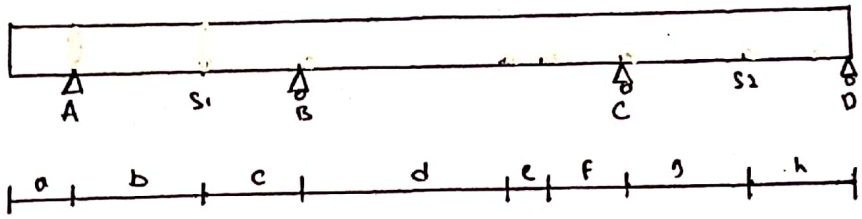
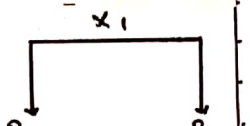
Diketahui Struktur balok gerber dengan beban seperti tergambar.



Data - data sebagai berikut.

Beban		Jarak			Beban berjalan	
q	3,1 Ton/m	a	1,6	m	P_1	2,6 Ton
		b	3,2	m	P_2	5 Ton/m
		c	2,3	m		
		d	5	m		
Jenis Balok		e	1	m		
Tipe 1		f	2	m		
		g	3	m		
		h	2,8	m	X_1	3,2 m



Pertanyaan :

a. Hitung dan gambarkan bidang momen dan Lintang akibat beban tetap yang bekerja

b. Hitung dan gambar garis pengaruh momen dan lintang akibat beban jika P = 1 ton bergerak dari tumpuan A ke B, pada titik Potongan.
   - I = m dari titik A
   - II = m dari titik B
   - III = m dari titik C

c. Hitung besar momen ekstrim dan lintang ekstrim pada Poin (b) akibat rangkaian beban berjalan (P_1 dan P_2) dari A ke B.

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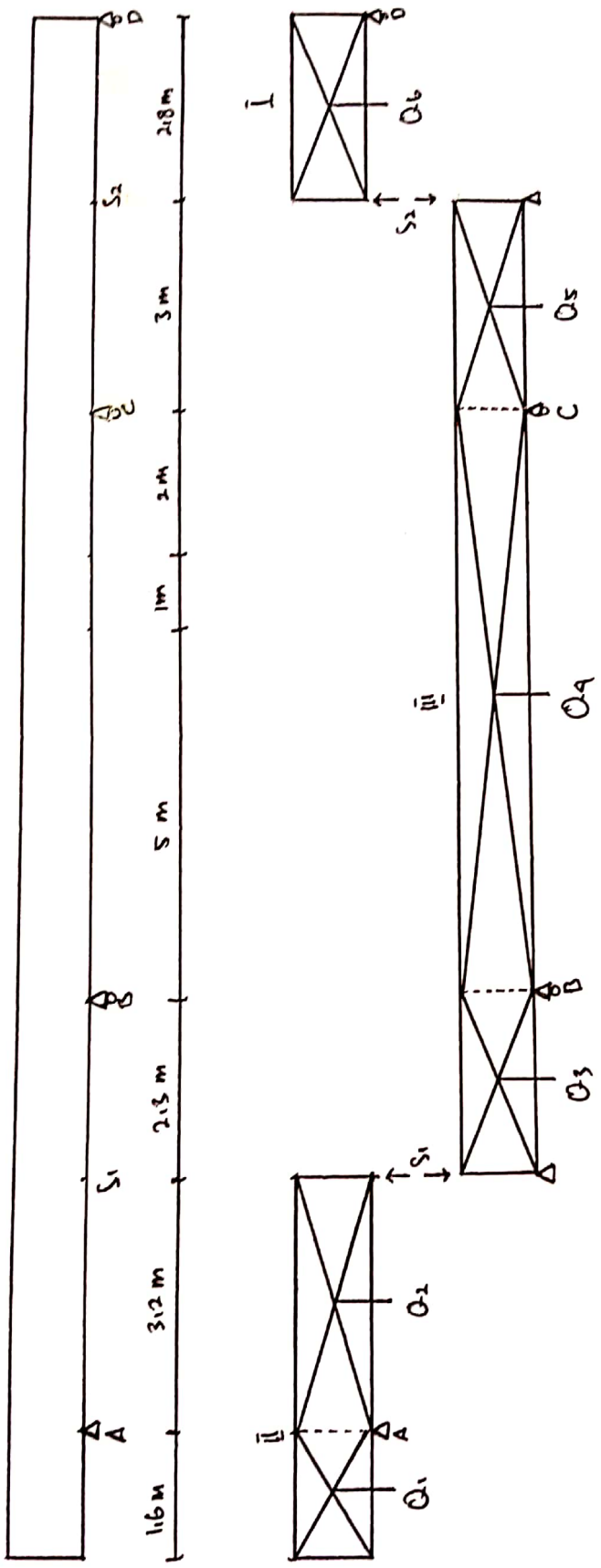

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$Q_1 = q \cdot a$
$= 3{,}1 \cdot 1{,}16$
$= 4{,}196$

$Q_2 = q \cdot b$
$= 3{,}1 \cdot 3{,}12$
$= 9{,}92$

$Q_3 = q \cdot c$
$= 3{,}1 \cdot 2{,}3$
$= 7{,}13$

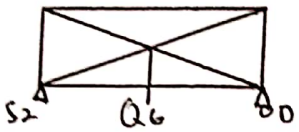
$Q_4 = q \cdot (d+e+f)$
$= 3{,}1 \cdot (8)$
$= 24{,}8$

$Q_5 = q \cdot g$
$= 3{,}1 \cdot 3$
$= 9{,}3$

$Q_6 = q \cdot h$
$= 3{,}1 \cdot 2{,}8$
$= 8{,}68$

- Reaksi perletakan

Bentang $S_2 - D$



$\Sigma MD = 0$

$R_{S_2} \cdot h - Q_6 \cdot \frac{h}{2} = 0$

$R_{S_2} \cdot 2{,}8 - 8{,}68 \cdot 1{,}4 = 0$

$R_{S_2} = \frac{12{,}1520}{2{,}8}$

$R_{S_2} = 4{,}34 \uparrow$ (↑) kearah atas

$\Sigma M_{S_2} = 0$

$-R_{DV} \cdot h + Q_6 \cdot \frac{h}{2} = 0$

$-R_{DV} \cdot 2{,}8 + 8{,}68 \cdot 1{,}4 = 0$

$R_{DV} = \frac{-12{,}1520}{-2{,}8}$

$R_{DV} = 4{,}34 \uparrow$ (↑) kearah atas.

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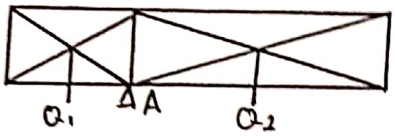
$\Sigma V = 0$

$R_{S2} + R_{DV} - Q_6 = 0$

$4{,}134 + 4{,}134 - 8{,}168 = 0$

$0 = 0$ Ok!

- Bentang E - S.



$\Sigma M_{S1} = 0$

$-Q_1 \cdot (a/2 + b) + R_{AV}(b) - Q_2(b/2) = 0$

$-4{,}196\,(4) + R_{AV}(3{,}2) - 9{,}192\,(1{,}6) = 0$

$R_{AV} \cdot 3{,}2 = -35{,}7126$

$R_{AV} = 11{,}1600$ T ' (kearah atas)

$\Sigma M_A = 0$

$-Q_1 \cdot (a/2) + Q_2(b/2) - R_{S1}(b) = 0$

$-4{,}196(0{,}8) + 9{,}192(1{,}6) - R_{S1}(3{,}2) = 0$

$R_{S1} \cdot 3{,}2 = 11{,}9040$

$R_{S1} = 3{,}7200$ T (kearah atas)

- Checking

$\Sigma V = 0$

$R_{AV} + R_{S1} - \Sigma P = 0$

$11{,}1600 + 3{,}72 - 4{,}196 - 9{,}192 = 0$

$0 = 0$ Ok!

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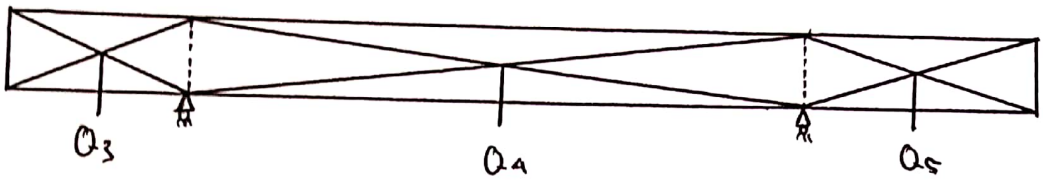
• Bentang $S_1 - S_2$



$\Sigma M_C = 0$

$-R_{S_1}(c+d+e+f) - Q_3(c/2 + d+e+f) + R_B(d+e+f) - Q_4\left(\frac{d+e+f}{2}\right) + Q_5(g/2) + R_{S_2}(g) = 0$

$-3{,}172(10{,}3) - 7{,}13(9{,}15) + R_B(8) - 24{,}18(4) + 9{,}13(1{,}15) + 4{,}134(3) = 0$

$R_B(8) - 175{,}7855 = 0$

$R_B \cdot 8 = 175{,}7855$

$R_B = 21{,}9732\ T$ (ke arah atas ↑)

$\Sigma M_B = 0$

$-R_{S_1}(c) - Q_3(c/2) + Q_4\left(\frac{d+e+f}{2}\right) + Q_5(g/2 + d+e+f) - R_C(d+e+f) + R_{S_2}(d+e+f+g) = 0$

$-3{,}172(28) - 7{,}13(1{,}15) + 24{,}18(4) + 9{,}13(9{,}15) - R_C(8) + 4{,}134(11) = 0$

$-R_C(8) + 218{,}5345 = 0$

$-R_C \cdot 8 = -218{,}5345$

$R_C = 27{,}3168$

• Checking

$\Sigma V = 0$

$R_B + R_C - R_{S_1} - Q_3 - Q_4 - Q_5 - R_{S_2} = 0$

$21{,}9732 + 27{,}3168 - 3{,}172 - 7{,}13 - 24{,}18 - 9{,}13 - 4{,}134$

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- Perhitungan Lintang

- DE = 0 T
- DA kiri = -q.0 = -3,1 x 1,6 = -4,96 T
- DA = -q.a + RAV = -3,1 x 1,6 + 11,16 = 6,2 T
- DS1 kiri = -q(a+b) + RAV = -3,1 x 4,8 + 11,16 = -3,72 T
- DS1 = -q(a+b) + RAV - q.0 = -3,1(4,8) + 11,16 - 3,1(0) = -3,72 T
- DB kiri = -q(a+b) + RAV - q.c = -3,1(4,0) + 11,16 - 3,1(2,3) = -10,85 T
- DB = -q(a+b) + RAV - q.c + RBV
  = -3,1(4,8) + 11,16 - 3,1(2,3) + 21,9732 = 11,1232 T
- Dc kiri = -q(a+b) + RAV - q(c+d+e+f) + RBV
  = -3,1(4,8) + 11,16 - 3,1(10,3) + 21,9732 = -13,6768 T
- Dc = -q(a+b) + RAV - q(c+d+e+f) + RBV + RCV
  = -3,1(4,8) + 11,16 - 3,1(10,3) + 21,9732 + 27,3168 = 13,64 T
- DS2 kiri = -q(a+b) + RAV - q(c+d+e+f+g) + RBV + RCV
  = -3,1(4,8) + 11,16 - 3,1(13,3) + 21,9732 + 27,3168 = 4,134 T
- DS2 = -q(a+b) + RAV - q(c+d+e+f+g) + RBV + RCV - q.0
  = -3,1(4,8) + 11,16 - 3,1(13,3) + 21,9732 + 27,3168 - 3,1.0
  = 4,134 T
- D D kiri = -q(a+b) + RAV - q(c+d+e+f+g) + RBV + RCV - q.h
  = -3,1(4,8) + 11,16 - 3,1(13,3) + 21,9732 + 27,3168 - 3,1.2,8
  = -4,134 T
- DD = -q(a+b) + RAV - q(c+d+e+f+g) + RBV + RCV - q.h + RDV
  = -3,1(4,8) + 11,16 - 3,1(13,3) + 21,9732 + 27,3168 - 3,1.2,8 + 4,134
  = 0 T

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- perhitungan Momen

1. Bentang E - S_1

$M_E = 0$ Tm

$M_A = -1/2 \cdot q \cdot a^2 + RAV\,(a-a)$

$= -0{,}5 \cdot 3{,}1 \cdot (1{,}6)^2 + 11{,}16\,(1{,}6 - 1{,}6) = -3{,}9680$ Tm

$M_{S_1} = -1/2\,q \cdot (a+b)^2 + RAV\,((a+b)-a)$

$= -0{,}5 \cdot 3{,}1 \cdot (4{,}8)^2 + 11{,}16\,(3{,}6) = 0$ Tm.

$M_{max_1} = -q \cdot a - q \cdot x + RAV$

$x = \dfrac{-q \cdot a + RAV}{q}$

$= \dfrac{-3{,}1 \cdot 1{,}6 + 11{,}16}{3{,}1}$

$= 2$ m (dari titik A)

$M_{max} = -a_1\,(a/2 + x) + RAV\,(x) - 1/2\,q x^2$

$= -4{,}96\,(2{,}8) + 11{,}16\,(2) - 0{,}5 \cdot 3{,}1 \cdot (2)^2$

$= 2{,}2320$ Tm.

2. Bentang S_1 - S_2

$M_B = -RS_1 \cdot c - 1/2 \cdot q \cdot c^2$

$= -3{,}172 \cdot 2{,}3 - 0{,}5 \cdot 3{,}1\,(2{,}3)^2 = -16{,}7555$ Tm.

$M_C = -RS_1\,(c+d+e+f) - 1/2 \cdot q \cdot (c+d+e+f)^2 + RBV\,((c+d+e+f) - c)$

$= -3{,}172\,(10{,}3) - 0{,}5 \cdot 3{,}1 \cdot (10{,}3)^2 + 21{,}9732\,(8) = -26{,}9699$

$M_{max_2} = -a_1\,(a/2 + b + c + x) + RAV\,(b+c+x) - a_2\,(b/2 + c + x) - a_3\,(c/2 + x) + RBv\,(x) - 1/2\,q x^2$

$x = \dfrac{-a_1 + RA - a_2 - a_3 + RB}{q}$

$= \dfrac{-4{,}96 + 11{,}16 - 9{,}92 - 7{,}13 + 21{,}9732}{3{,}1}$

$= 3{,}5881$ m. (dari titik B)

$M_{max_2} = -4{,}96\,(9{,}8881) + 11{,}16\,(9{,}0881) - 9{,}92\,(7{,}4881) - 7{,}13\,(4{,}7381) + 21{,}9732\,(3{,}5881) - 1{,}55\,(3{,}5881)^2$

$= -49{,}0495 + 101{,}4232 - 74{,}2810 - 33{,}7827 + 78{,}8420 - 19{,}9554$

$= 3{,}2006$ TM.

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3. Bentang S2 - D

$M_{S_2} = RS_2 \cdot 0 - 1/2 \cdot q \cdot 0^2$

$= 4{,}139 \cdot 0 - 0{,}5 \cdot 3{,}1 \cdot 0^2 = 0$ Tm.

$M_D = RS_2 \cdot h - 1/2 \cdot q(h)^2$

$= 4{,}139 \cdot 2{,}8 - 0{,}5 \cdot 3{,}1 \cdot (2{,}8)^2 = 0$ Tm.

$M_{max_2} = RS_2 \cdot x - 1/2 \cdot q \cdot x^2$

$= 4{,}139 \cdot x - 1/2 \cdot 3{,}1 \cdot x^2$

$= 4{,}139\,x - 1{,}55\,x^2$

$Mx' = 4{,}139 - 3{,}1x$

$x = Mx' = 0$

$0 = 4{,}139 - 3{,}1x$

$3{,}1x = 4{,}139$

$x = \frac{4{,}139}{3{,}1}$

$x = 1{,}4$ m (dari titik S_2)

$M_{max_3} = 4{,}139(1{,}4) - 1{,}55(1{,}4)^2$

$= 6{,}0766 - 3{,}0386$

$= 3{,}0380$ Tm.

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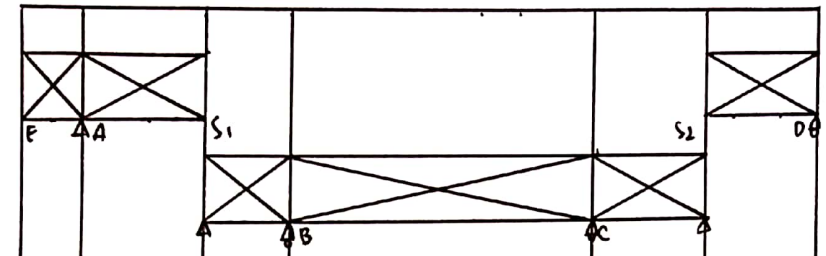
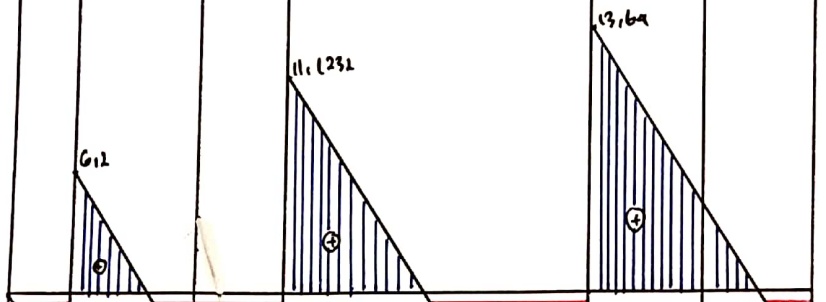
Gambar Bidang Lintang dan momen.

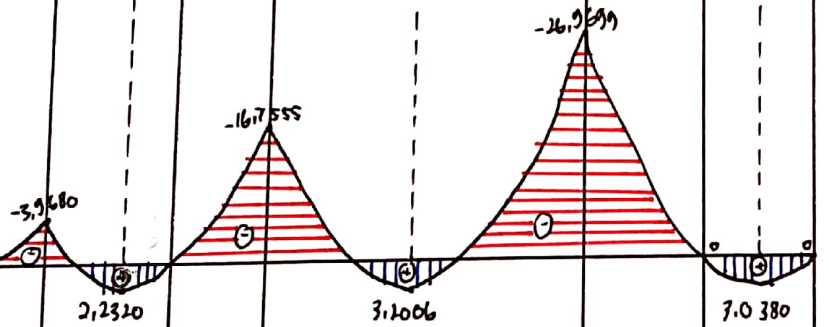
Skala 1:2



Skala 1:2



Skala 1:9



Skala 1:10

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LEMBAR ASISTENSI TUGAS SEMESTER

NAMA : **Denny Kurniawan**
NPM : **2255011002**
SEMESTER : **1 (Satu)**
MATA KULIAH : **STATIKA**

NO	TANGGAL	KETERANGAN	PARAF

Bandarlampung, 25 September 2022
Asisten Dosen

RYAN NATANAEL USWADI
NPM. 2015011007

Bagian B.

- Perhitungan GP Lintang pada Potongan 1 (4m dari A).

$Y_1 = \frac{D}{3,2}$

$= \frac{1,6}{3,2} = 0,5 \quad T$

$Y_2 = -1\ T$

- Perhitungan GP Lintang pada Potongan II (4m dari B)

$Y_1 = -\left(\frac{x}{d+e+f}\right)$

$= -\frac{4}{8} = -0,5T$

$Y_2 = \frac{(d+e+f-x)}{d+e+f}$

$= \frac{4}{8} = 0,5\ T$

$Y_3 = \frac{(d+e+f)-(d+e+f+g)}{(d+e+f)}$

$= \frac{8-11}{8} = -0,375T$

$Y_4 = \left(\frac{c}{d+e+f}\right)$

$= \frac{2,3}{8} = 0,2875\ T$

$Y_5 = -\left(\frac{a \cdot Y_4}{b+c}\right)$

$= -\frac{1,6 \times 0,2875}{5,5} = -0,0836\ T.$

- Perhitungan GP Lintang pada Potongan III (4m dari C)

$Y_1 = -\frac{x}{h}$

$= -\frac{1}{2,8} = -0,3571\ T$

$Y_2 = \frac{(g+h-x)}{h}$

$= \frac{1,8}{2,8} = 0,6429\ T$

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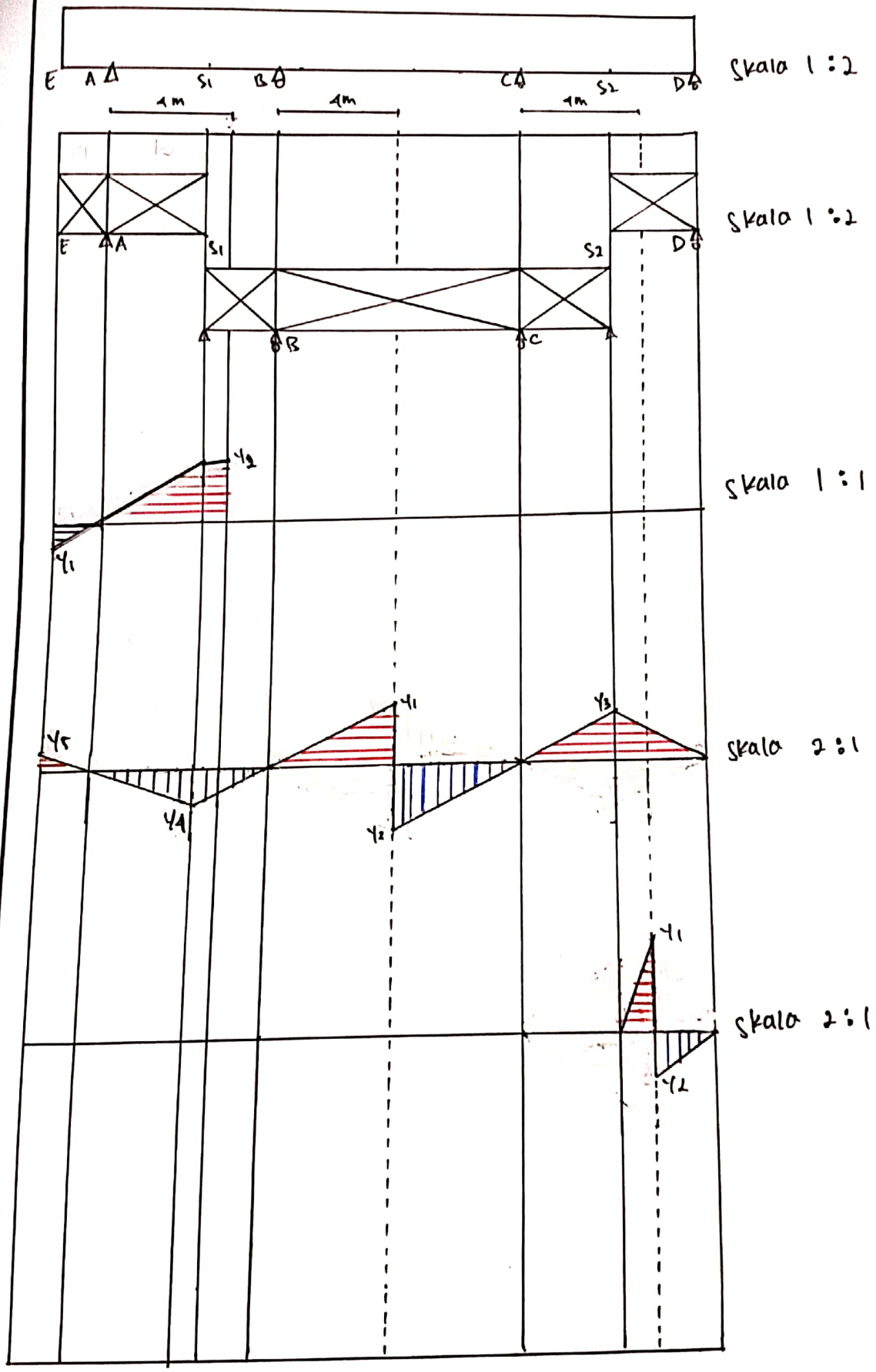
Gambar Garis Pengaruh Gaya Lintang.



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• Perhitungan GP momen pada Potongan 1 (4m dari A)

$y_1 = A - b$

$= 0{,}18$

$My_1 = 0{,}18 \times 1$

$= 0{,}18$ Tm.

$y_2 = \frac{(b+c-x) \cdot a}{b}$

$= \frac{0{,}18 \cdot 1{,}16}{3{,}2} = 0{,}14$

$My_1 = 0{,}14 \times 1 = 0{,}14$ Tm.

• Perhitungan GP momen pada Potongan II (4m dari B)

$y_1 = \frac{x}{(d+e+f)} \times (d+e+f-x)$

$= \frac{4}{8} \times 4 = 2$

$My_1 = 2 \times 1 = 2$ Tm.

$y_2 = \left(\frac{(d+e+f) - (d+e+f+g)}{(d+e+f)} \right) \cdot X$

$= \frac{8 - 11}{8} \times 4 = -1{,}5$

$My_2 = P \times y_2 = 1 \times -1{,}5$

$= -1{,}5$ Tm.

$y_3 = \frac{x \times c}{d+e+f}$

$= \frac{4 \times 2{,}3}{8} = 1{,}15$

$My_3 = P \times y_3$

$= 1 \times 1{,}15 = 1{,}15$ Tm.

$y_4 = \frac{y_3 \times a}{b}$

$= \frac{1{,}15 \times 1{,}6}{3{,}2} = 0{,}575$

$My_4 = P \cdot y_4$

$= 1 \cdot 0{,}575 = 0{,}575$ Tm.

• Perhitungan GP Momen pada Potongan III (4m dari C)

$y_1 = \left(\frac{x}{h} \right) \cdot (g+h-x)$

$= \frac{1}{2{,}8} \cdot 1{,}8 = 0{,}6429$

$My_1 = P \cdot y_1$

$= 1 \cdot 2{,}5714$

$= 2{,}5714$ Tm.

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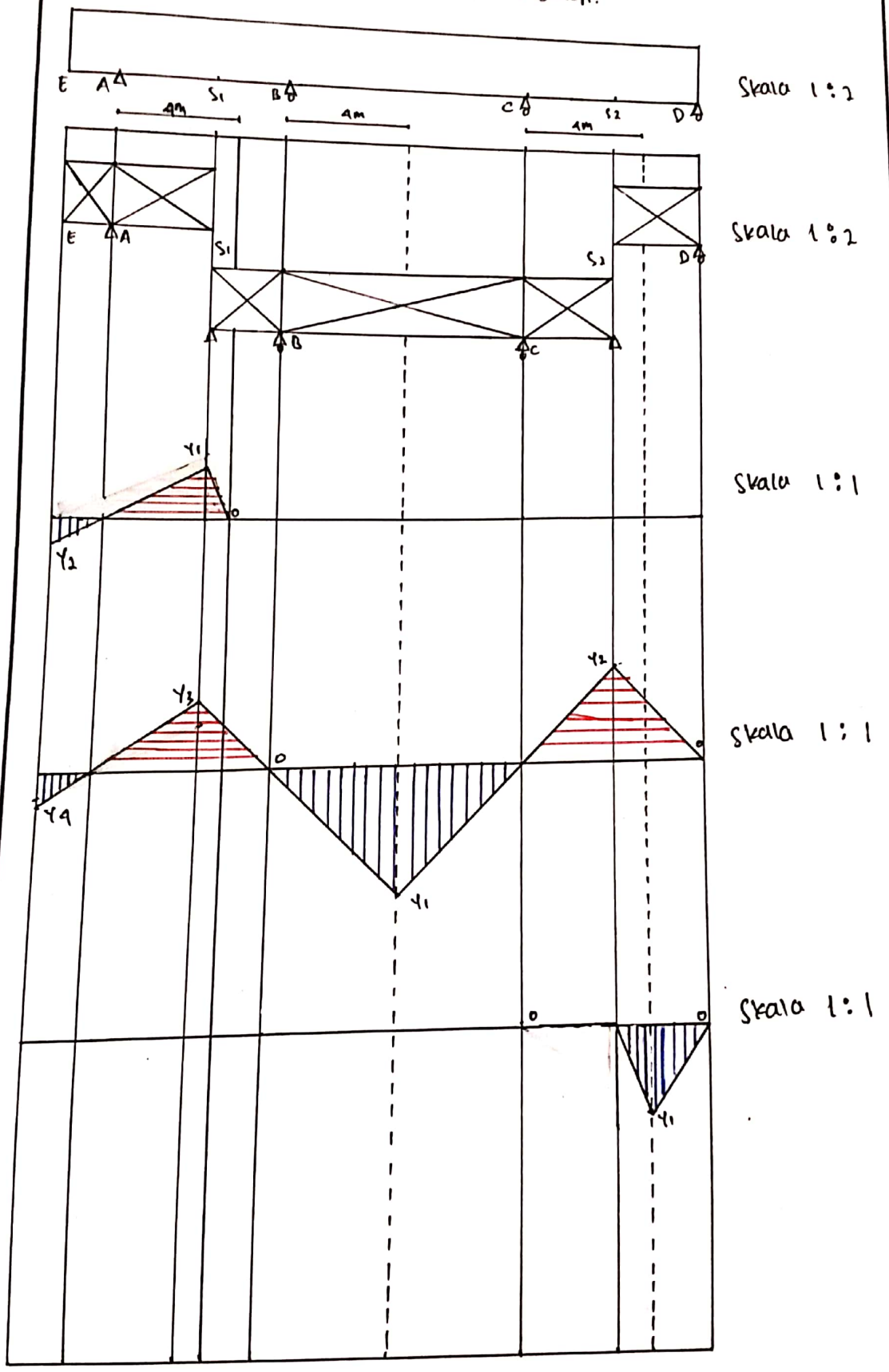
Gambar Garis Pengaruh Gaya Momen.



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LEMBAR ASISTENSI TUGAS SEMESTER

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NPM : **2255011002**
SEMESTER : **1 (Satu)**
MATA KULIAH : **STATIKA**

NO	TANGGAL	KETERANGAN	PARAF
1.	15/11-2022	Tinjau Lintang dan momen pertitik	
2.	16/11-2022	Perbaiki tinjauan momen	
3.	23/11-2022	Perhitungan 4a OK! lanjut kan 4b.	

Bandarlampung, 25 September 2022
Asisten Dosen

RYAN NATANAEL USWADI
NPM. 2015011007

C. Perhitungan Garis Pengaruh Gaya Lintang.

a. Garis pengaruh gaya lintang di titik 1.

↳ Titik 1.

- $y_1 = \frac{a}{b} = \frac{1,6}{3,2} = 0,5$
- $y_2 = -1$
- $y_3 = \frac{y_2 (x-a)}{b} = \frac{-1 (1,6)}{3,2} = -0,5$

↳ Di Negatif

kondisi II = $P_2 \cdot y_3$
= $5 \cdot (-0,5)$
= $-2,5$ T

kondisi III = $P_2 \cdot y_2$
= $5 \cdot (-1)$
= -5 T

kondisi IV = $P_1 \cdot y_2$
= $2,6 \cdot -1$
= $-2,6$ T

↳ Di Positif

kondisi 1 = $P_2 \cdot y_1$
= $5 \cdot 0,5$
= $2,5$ T

kondisi II = $P_1 \cdot y_1$
= $2,6 \cdot 0,5$
= $1,3$ T

Lintang ekstrem min terjadi pada kondisi III = -5 T

Lintang ekstrem max terjadi pada kondisi 1 = $2,5$ T

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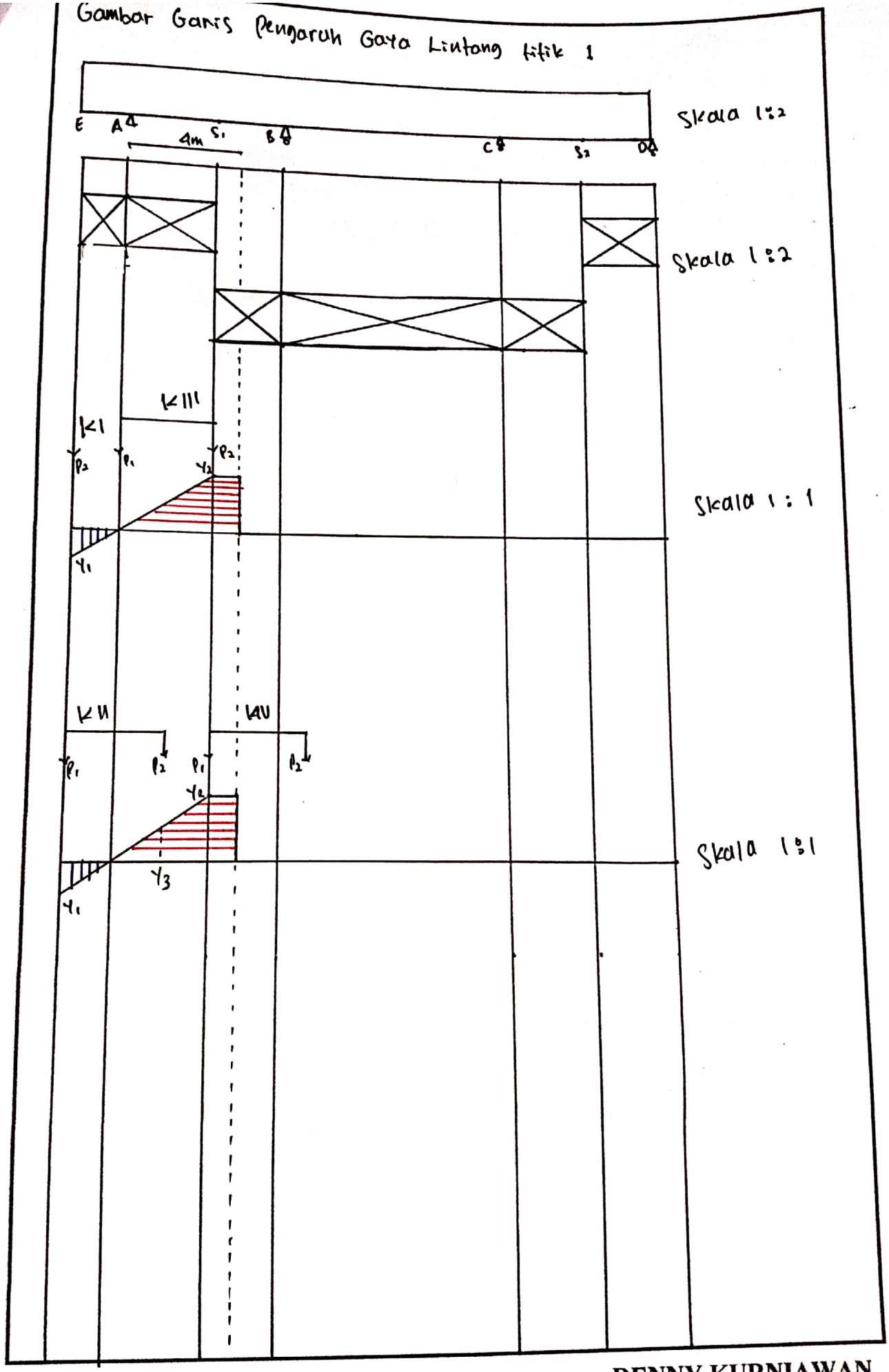
Gambar Garis Pengaruh Gaya Lintang titik 1



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b. Garis pengaruh gaya lintang di titik II.

Di titik II

- $y_1 = -\left(\frac{x}{\text{jarak}}\right) = -\left(\frac{4}{8}\right) = -0.5$
- $y_2 = \left(\frac{\text{jarak} - x}{\text{jarak}}\right) = \left(\frac{4}{8}\right) = 0.5$
- $y_3 = \frac{y_1 \times (4 - x_1)}{4} = \frac{-0.5 \times 0.8}{4} = -0.1$
- $y_4 = \frac{y_2 \times 0.8}{4} = \frac{0.5 \times 0.8}{4} = 0.1$

Di Negatif

- kondisi I $= P_1 \cdot y_3 + P_2 \cdot y_1$
  $= 2.6(-0.1) + 5(-0.5)$
  $= -2.76$ T
- kondisi II $= P_1 \cdot y_1$
  $= 2.6(-0.5)$
  $= -1.3$ T

Di Positif

- kondisi I $= P_2 \cdot y_2$
  $= 5(0.5)$
  $= 2.5$ T
- kondisi II $= P_1 \cdot y_2 + P_2 \cdot y_4$
  $= 2.6(0.5) + 5(0.1)$
  $= 1.8$ T

Lintang ekstrem min terjadi pada kondisi I = -2.76 T

Lintang ekstrem max terjadi pada kondisi I = 2.5 T.

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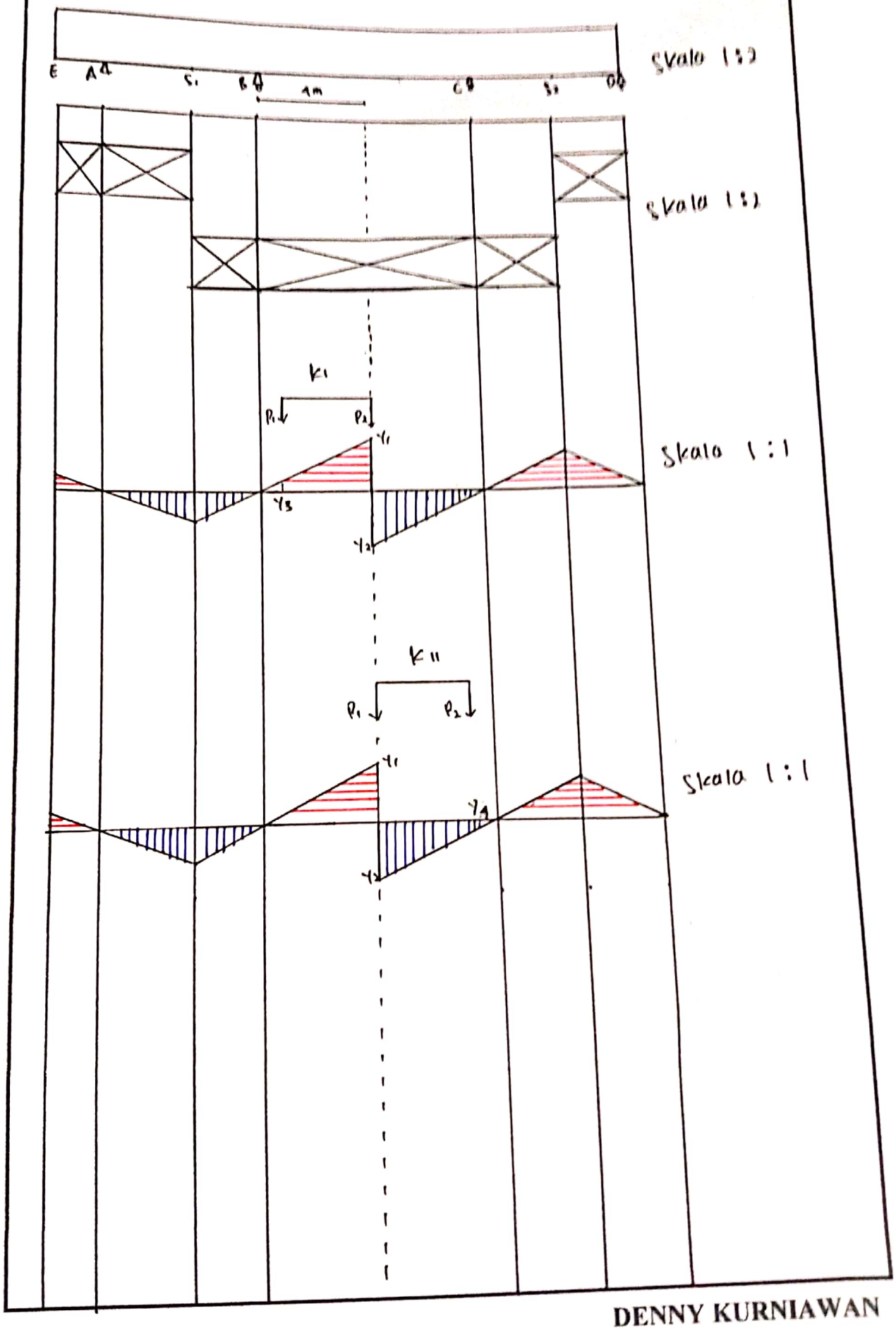
Gambar Garis Pengaruh Gaya Lintang Titik II



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C. Garis pengaruh gaya lintang di titik III

Lo titik III

- $y_1 = \frac{(x-n)}{h} \cdot \frac{1}{2{,}8} = -0{,}3571$
- $y_2 = \frac{(n+h-x)}{h} = \frac{1{,}8}{2{,}8} = 0{,}6429$

Lo D III Negatif

- kondisi I = $P_2 \cdot y_1$
  $= 5 \cdot (-0{,}3571)$
  $= -1{,}7855$ T
- kondisi II = $P_1 \cdot y_1$
  $= 2{,}6 \cdot (-0{,}3571)$
  $= -0{,}9285$

Lo D III Positif

- kondisi I = $P_2 \cdot y_2$
  $= 5 \cdot (0{,}6429)$
  $= 3{,}2145$ T
- kondisi II = $P_2 \cdot y_2$
  $= 2{,}6 \cdot (0{,}6429)$
  $= 1{,}6715$ T

Lintang ekstrem min terjadi pada kondisi I = $-1{,}7855$ T

Lintang ekstrem max terjadi pada kondisi I = $3{,}2145$ T.

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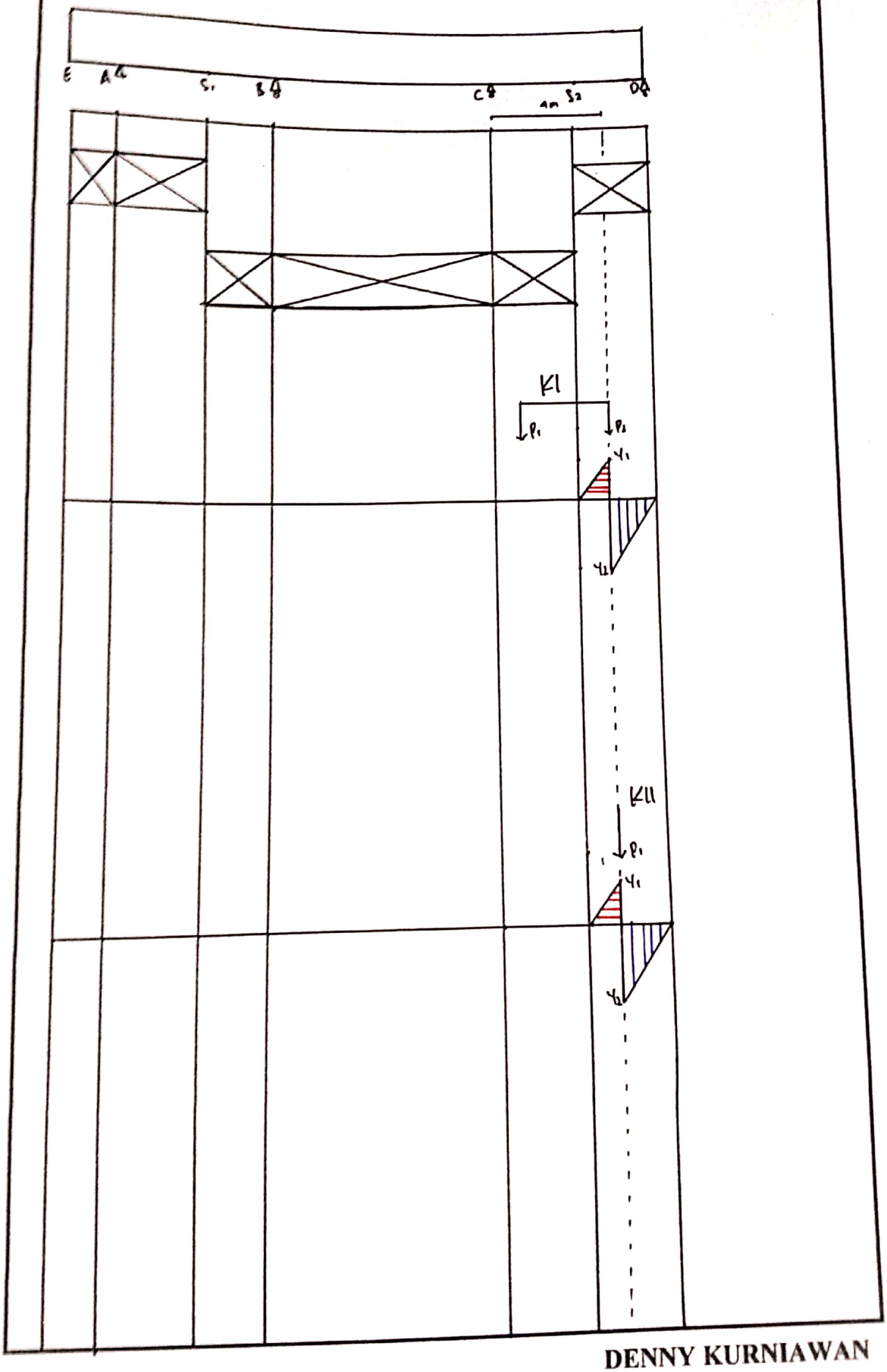
Gambar Garis Pengaruh Gaya Lintang Titik III.



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Perhitungan Garis Pengaruh Gaya momen

a. Garis pengaruh gaya momen di titik 1

Lo Titik 1

- $y_1 = -(4-b) = -0{,}8$
- $y_2 = \frac{(b+c-x)\cdot a}{b} = \frac{0{,}8 \cdot 1{,}6}{3{,}2} = 0{,}4$
- $y_3 = -\frac{y_1 (a+b+x_1)}{b} = \frac{0{,}8\,(4{,}8-3{,}2)}{3{,}2} = -0{,}4$

Lo M_1 Negatif

- kondisi II $= P_2 \cdot y_3$
  $= 5 \cdot (-0{,}4)$
  $= -2$ TM.
- kondisi III $= P_2 \cdot y_1$
  $= 5 \cdot (-0{,}8)$
  $= -4$ Tm
- kondisi IV $= P_1 \cdot y_1$
  $= 2{,}6 \cdot (-0{,}8)$
  $= -2{,}08$ Tm.

Lo M_1 Positif

- kondisi I $= P_2 \cdot y_2$
  $= 5 \cdot 0{,}4$
  $= 2$ Tm.
- kondisi II $= P_1 \cdot y_2$
  $= 2{,}6 \cdot 0{,}4$
  $= 1{,}04$ Tm.

Momen ekstrem min terjadi pada kondisi III $= -4$ Tm.

Momen ekstrem max terjadi pada kondisi I $= 2$ Tm.

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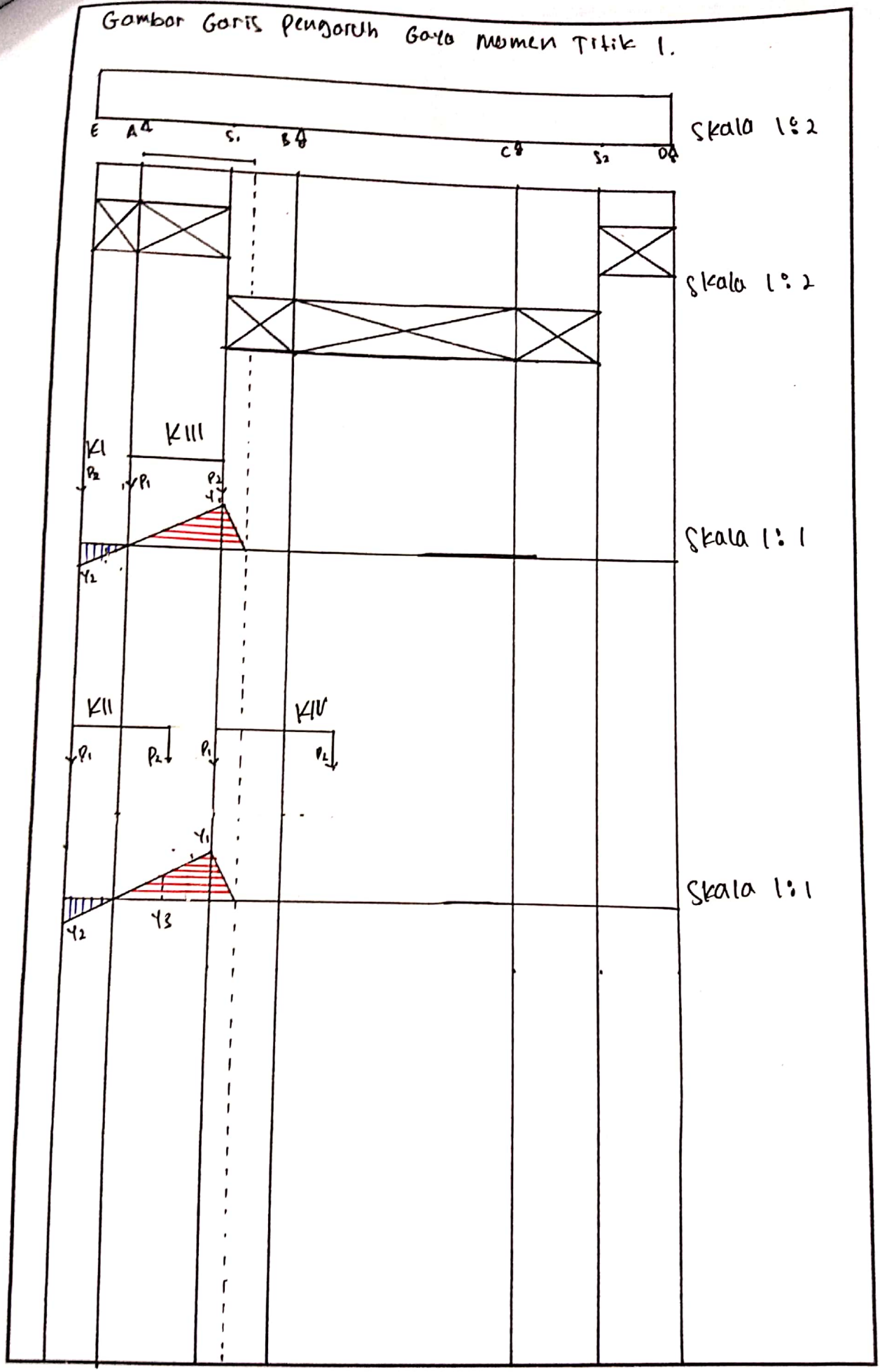
Gambar Garis Pengaruh Gaya Momen Titik 1.



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b. Garis pengaruh gaya momen di titik 11.

Lo titik 11.

- $Y_1 = \left(\frac{x}{d+c+f}\right) \cdot (d+c+f-x) = \frac{4}{8} \times 4 = 2$
- $Y_2 = \left(\frac{(d+c+f)-(d+c+f+7)}{(d+c+f)}\right) \cdot x = \frac{8-11}{8} \times 4 = -1,5$
- $Y_3 = \frac{x \cdot c}{d+c+f} = \frac{4 \cdot 2,3}{8} = 1,15$
- $Y_4 = \frac{Y_1 (x - x_1)}{x} = \frac{2 (4 - 3,2)}{4} = 0,4$
- $Y_5 = \frac{Y_1 (x_1 - 9)}{10} = \frac{2 (3,2 - 3)}{4} = 0,1$
- $Y_6 = \frac{Y_1 (10 - x_1)}{10} = \frac{2 (4 - 3,2)}{4} = 0,4$

Lo M_n Negatif

- kondisi III = $P_2 \cdot Y_2$
  $= 5 \cdot (-1,5)$
  $= -7,5$ Tm
- kondisi IV = $P_1 \cdot Y_2$
  $= 216 (-1,5)$
  $= -3,9$ Tm.

Lo M_n Positif

- kondisi I = $P_1 \cdot Y_4 + P_2 \cdot Y_1$
  $= 216 (0,4) + 5 (2)$
  $= 11,04$ Tm.
- kondisi II = $P_1 \cdot Y_1 + P_2 \cdot Y_6$
  $= 216 (2) + 5 \cdot (0,4)$
  $= 7,2$ Tm.
- kondisi III = $P_1 \cdot Y_5$
  $= 216 \cdot 0,1$
  $= 0,26$ Tm.

Momen ekstrem min terjadi pada kondisi III = -7,5 tm.

Momen ekstrem max terjadi pada kondisi I = 11,04 Tm.

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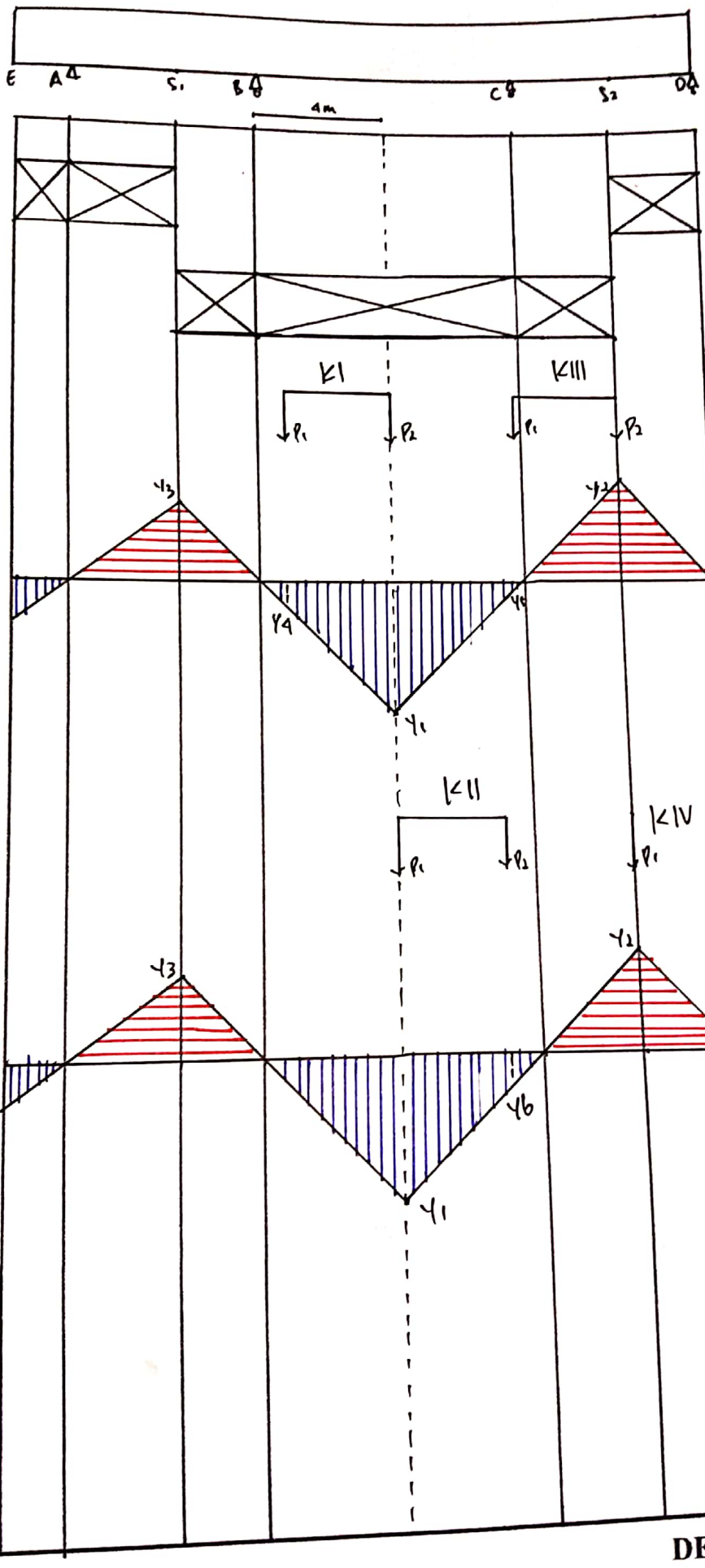
Gambar Garis Pengaruh Gaya momen Titik 11.



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C. Garis pengaruh gaya momen di titik III.

↳ Titik III.

$y_1 = \left(\frac{A-B}{h}\right)(a+h-x) = \left(\frac{1}{2{,}8}\right)(1{,}8) = 0{,}6429$

↳ M III Positif

- kondisi I $= P_2 . y_1$
  $= 5 . 0{,}6429$
  $= 3{,}2145$ Tm
- kondisi II $= P_1 . y_1$
  $= 2{,}6 . 0{,}6429$
  $= 1{,}6715$

Momen ekstrem max terjadi pada kondisi I = 3,2145 Tm.

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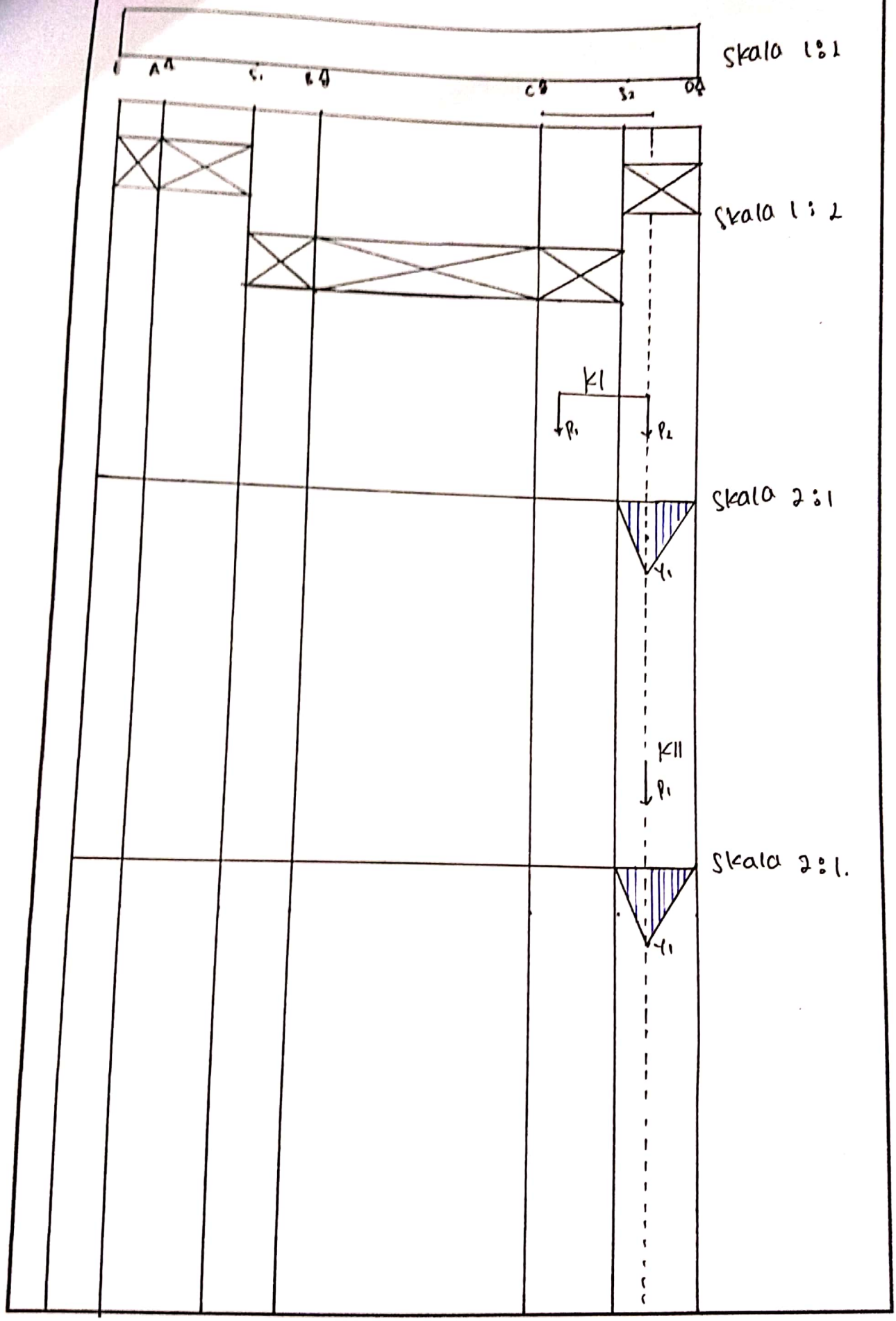
Gambar Garis Pengaruh Gaya momen Titik III.



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LEMBAR ASISTENSI TUGAS SEMESTER

NAMA : **Denny Kurniawan**
NPM : **2255011002**
SEMESTER : **1 (Satu)**
MATA KULIAH : **STATIKA**

NO	TANGGAL	KETERANGAN	PARAF
1.	15/11-2022	Tinjau Lintang dan momen pertitik	
2.	16/11-2022	Perbaiki tinjauan momen	
3.	23/11-2022	Perhitungan 4a OK! lanjut kan 4b.	

Bandarlampung, 25 September 2022
Asisten Dosen

RYAN NATANAEL USWADI
NPM. 2015011007