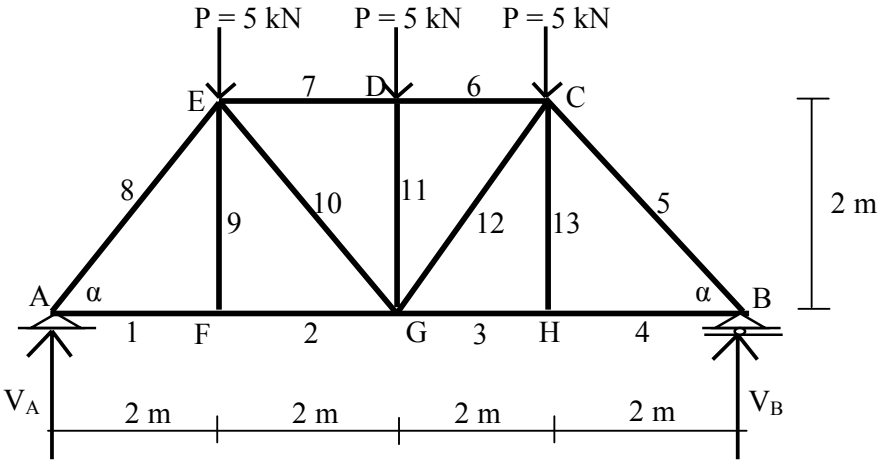
Pertemuan XVI

VIII. Ujian Akhir Semester

VIII.1 Contoh Soal dan Penyelesaian (UAS 18 Juli 2011)

Soal.1 Tentukan gaya-gaya batang, konstruksi rangka batang di bawah ini.



Penyelesaian :

- Kestabilan konstruksi :

  2.8 – 13 – 3 = 0 konstruksi stabil.

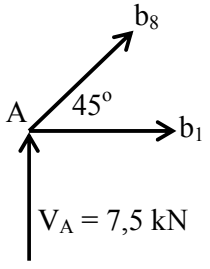
- Reaksi perletakan :

$$\Sigma M_B = 0 \rightarrow V_A.8 - 5.6 - 5.4 - 5.2 = 0 \rightarrow V_A = \frac{30+20+10}{8} = 7{,}5.kN(\uparrow)$$

$$\Sigma M_A = 0 \rightarrow -V_B.8 + 5.6 + 5.4 + 5.2 = 0 \rightarrow V_B = \frac{30+20+10}{8} = 7{,}5.kN(\uparrow)$$

- Gaya-gaya batang :

  Keseimbangan titik A



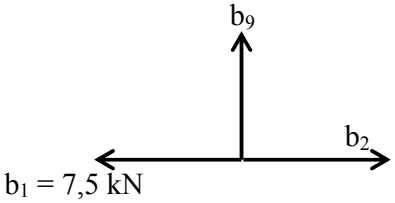
$$\Sigma V = 0 \rightarrow V_A + b_8 \sin \alpha = 0$$

$$b_8 = -\frac{7{,}5}{\sin 45} = -.10{,}607 \ kN \ ....(\ tekan\ )$$

$$\Sigma H = 0 \rightarrow b_1 + b_8 \cos \alpha = 0$$

$$b_1 = 10{,}607 \cos 45 = 7{,}5.kN \ ...(\ tarik\ )$$

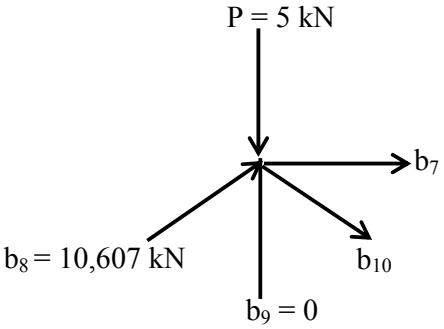
Keseimbangan titik F



$$\Sigma V = 0 \rightarrow b_9 = 0$$

$$\Sigma H = 0 \rightarrow -b_1 + b_2 = 0$$
$$b_2 = 7,5 \, .kN \; ...(\; tarik \;)$$

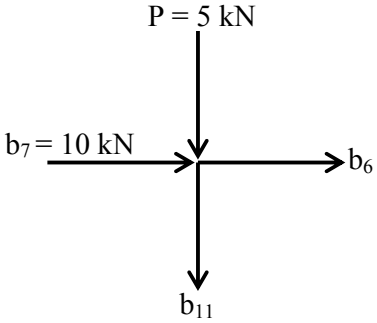
Keseimbangan titik E



$$\Sigma V = 0 \rightarrow b_8 \sin \alpha - P - b_{10} \sin \alpha = 0$$
$$b_{10} = \frac{(10,607 \sin 45) - 5}{\sin 45}$$
$$= 3,536 \; .kN \; ...(\; tarik \;)$$

$$\Sigma H = 0 \rightarrow b_{10} \cos \alpha + b_8 \cos \alpha + b_7 = 0$$
$$b_7 = -3,536 \cos 45 - 10,607 \cos 45$$
$$= -10 \; .kN \; ...(\; tekan \;)$$

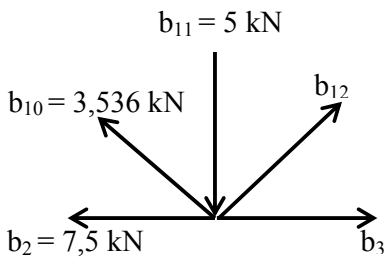
Keseimbangan titik D



$$\Sigma V = 0 \rightarrow -P - b_{11} = 0$$
$$b_{11} = -5 \, .kN \; ...(\; tekan \;)$$

$$\Sigma H = 0 \rightarrow b_7 + b_6 = 0$$
$$b_6 = -10 \; .kN \; ...(\; tekan \;)$$

Keseimbangan titik G



$\Sigma V = 0 \rightarrow b_{10} \sin \alpha - b_{11} + b_{12} \sin \alpha = 0$

$b_{12} = \dfrac{-3{,}536 \sin 45 + 5}{\sin 45}$

$\rightarrow b_{12} = 3{,}536\ .kN$ ...(*tarik*)

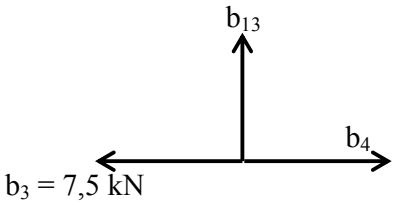
$\Sigma H = 0$

$\rightarrow -b_2 - b_{10} \cos \alpha + b_{12} \cos \alpha + b_3 = 0$

$\rightarrow b_3 = 7{,}5 + 3{,}536 \cos 45 - 3{,}536 \cos 45$

$\rightarrow b_3 = 7{,}5\ .kN$ ...(*tarik*)

Keseimbangan titik H

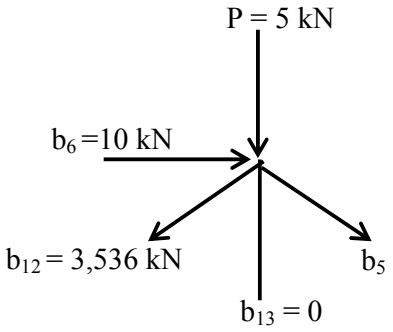


$\Sigma V = 0 \rightarrow b_{13} = 0$

$\Sigma H = 0 \rightarrow -b_3 + b_4 = 0$

$\rightarrow b_4 = 7{,}5\ .kN$

Keseimbangan titik C



$\Sigma V = 0 \rightarrow -b_{12} \sin \alpha - P - b_5 \sin \alpha = 0$

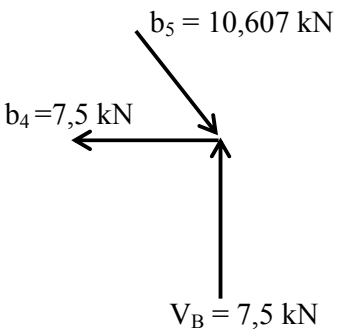
$b_5 = \dfrac{(-3{,}536 \sin 45) - 5}{\sin 45}$

$\rightarrow b_5 = -10{,}607\ .kN$ ...(*tekan*)

$\Sigma H = 0 \rightarrow -b_{12} \cos \alpha + b_6 + b_5 \cos \alpha = 0$

$-3{,}536 \cos 45 + 10 + (-10{,}607 \cos 45) = 0$

Keseimbangan titik B



$\Sigma V = 0$

$\rightarrow V_B - b_5 \sin \alpha = 0$

$\rightarrow 7,5 - 10,607 \sin 45 = 0$

$\Sigma H = 0$

$\rightarrow -b_4 + b_5 \cos 45 = 0$

$\rightarrow -7,5 + 10,607 \cos 45 = 0$

Tabel. Daftar Gaya-Gaya Batang Metode Keseimbangan Titik Simpul Cara Analitis

No Batang	Gaya-Gaya Batang (kN)	
	Tarik (+)	Tekan (-)
b_1	7,5	
b_2	7,5	
b_3	7,5	
b_4	7,5	
b_5		10,607
b_6		10
b_7		10
b_8		10,607
b_9	-	-
b_{10}		5
b_{11}		5
b_{12}	3,536	
b_{13}	-	-