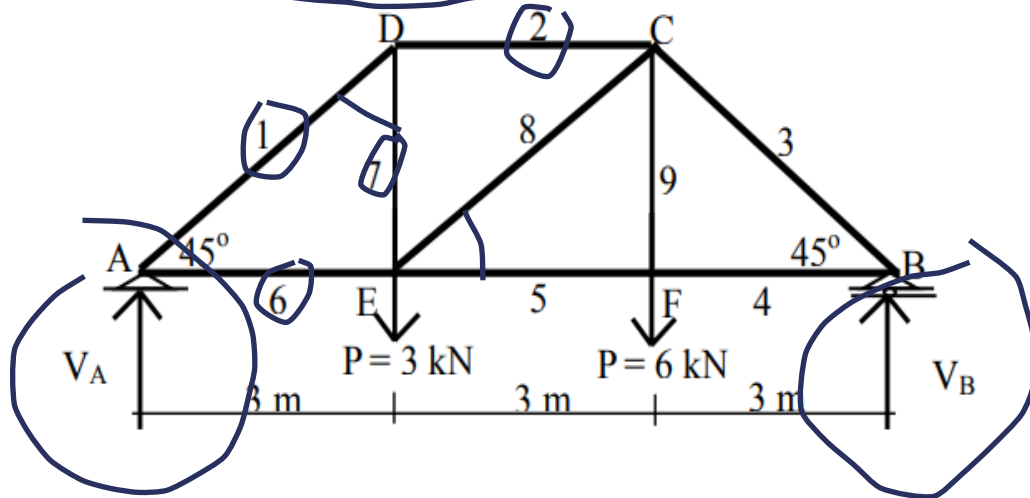


Contoh-Contoh Soal dan Pembahasan

Soal 1. Tentukan gaya-gaya batang dari rangka batang di bawah ini dengan metode keseimbangan titik simpul cara analitis (*metode of joint*).



Penyelesaian :

- Kestabilan konstruksi :
 $2.6 - 9 - 3 = 0$ konstruksi stabil.

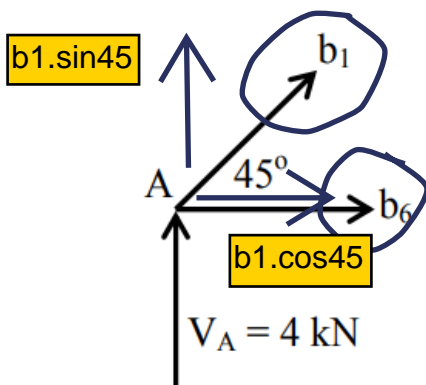
- Reaksi perletakan :

$$\sum M_B = 0 \rightarrow V_A \cdot 9 - 3 \cdot 6 - 6 \cdot 3 = 0 \rightarrow V_A = \frac{18 + 18}{9} = 4 \text{ kN} (\uparrow)$$

$$\sum M_A = 0 \rightarrow -V_B \cdot 9 + 3 \cdot 3 + 6 \cdot 6 = 0 \rightarrow V_B = \frac{9 + 36}{9} = 5 \text{ kN} (\uparrow)$$

- Gaya-gaya batang :

Keseimbangan titik A



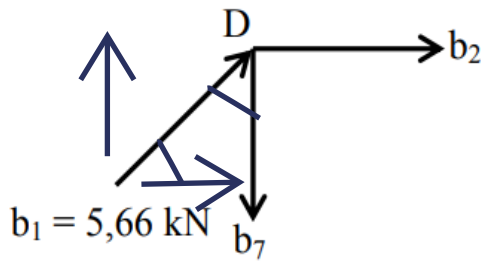
$$\sum V = 0 \rightarrow V_A + b_1 \sin \alpha = 0$$

$$b_1 = -\frac{4}{\sin 45} = -5,66 \text{ kN} \dots (\text{tekan})$$

$$\sum H = 0 \rightarrow b_6 + b_1 \cos \alpha = 0$$

$$b_6 = 5,66 \cos 45 = 4 \text{ kN} \dots (\text{tarik})$$

Keseimbangan titik D



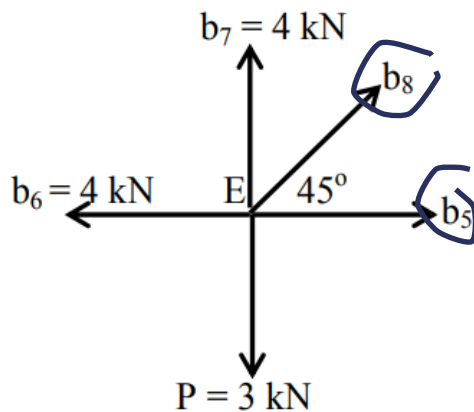
$$\Sigma V = 0 \rightarrow b_1 \sin \alpha - b_7 = 0$$

$$b_7 = 5,66 \sin 45 = 4 \text{ kN} \dots (\text{tarik})$$

$$\Sigma H = 0 \rightarrow b_1 \cos \alpha + b_2 = 0$$

$$b_2 = -5,66 \cos 45 = -4 \text{ kN} \dots (\text{tekan})$$

Keseimbangan titik E



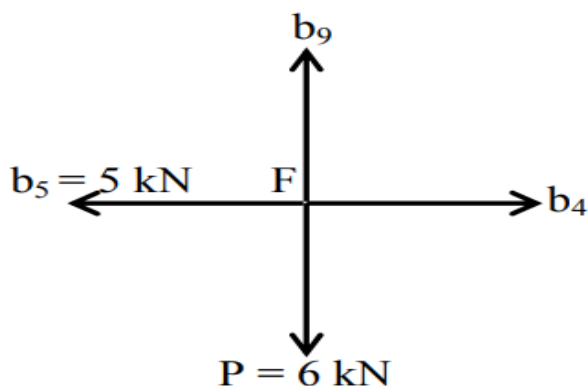
$$\Sigma V = 0 \rightarrow -P + b_7 + b_8 \sin \alpha = 0$$

$$b_8 = \frac{3 - 4}{\sin 45} = -1,414 \text{ kN} \dots (\text{tekan})$$

$$\Sigma H = 0 \rightarrow -b_6 + b_8 \cos \alpha + b_5 = 0$$

$$b_5 = 4 + (1,414 \cos 45) = 5 \text{ kN} \dots (\text{tarik})$$

Keseimbangan titik F



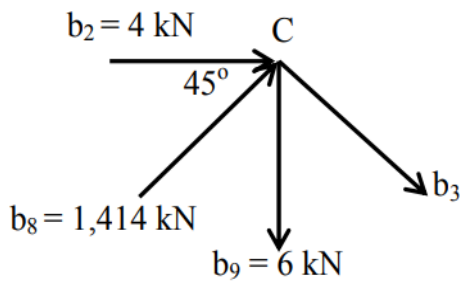
$$\Sigma V = 0 \rightarrow -P + b_9 = 0$$

$$b_9 = 6 \text{ kN} \dots (\text{tarik})$$

$$\Sigma H = 0 \rightarrow -b_5 + b_4 = 0$$

$$b_4 = 5 \text{ kN} \dots (\text{tarik})$$

Keseimbangan titik C



$$\Sigma V = 0 \rightarrow -b_9 + b_8 \sin \alpha - b_3 \sin \alpha = 0$$

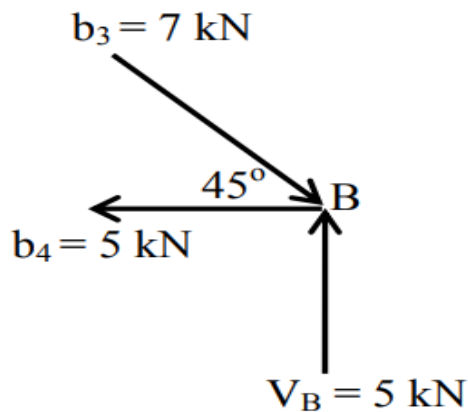
$$b_3 = \frac{-6 + 1,414 \sin 45}{\sin 45} = -7,07 \text{ kN} \dots (\text{tekan})$$

$$\Sigma H = 0$$

$$\rightarrow b_8 \cos \alpha + b_2 + b_3 \cos \alpha = 0$$

$$\rightarrow 1,414 \cos 45 + 4 + (-5) \cos 45 = 0$$

Keseimbangan titik B



$$\Sigma V = 0 \rightarrow V_B - b_3 \sin \alpha = 0$$

$$\rightarrow 5 - 7 \sin 45 = 0 \dots \text{oke}$$

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

$$\rightarrow -5 + 7 \cos 45 = 0 \dots \text{oke}$$

Tabel 6.3 Daftar Gaya-Gaya Batang Metode Keseimbangan Titik Simpul/Cara Analitis

No Batang	Gaya-Gaya Batang (kN)	
	Tarik (+)	Tekan (-)
b ₁	-	5,66
b ₂	-	4
b ₃	-	7,07
b ₄	5	-
b ₅	5	-
b ₆	4	-
b ₇	4	-
b ₈	-	1,414
b ₉	4	