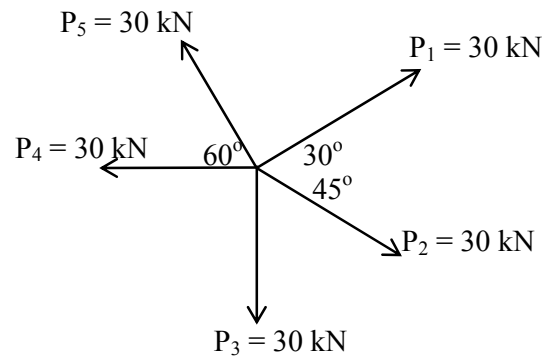


Pertemuan VIII

IV. Ujian Tengah Semester

IV.1 Contoh Soal dan Penyelesaian (UTS 2 Mei 2011)

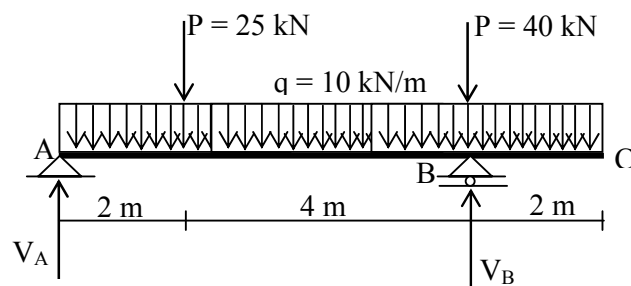
1. Suatu komposisi gaya-gaya seperti pada gambar.



Tentukanlah :

- a. Resultan gaya
- b. Arah resultan gaya

2. Suatu balok gantung dibebani muatan terpusat dan terbagi rata, seperti pada gambar di bawah ini.



Diminta :

- a. Mengitung reaksi perletakan
- b. Menurunkan persamaan gaya dalam
- c. Mengganbarkan diagram gaya dalam

Penyelesaian :

1. a. Resultan gaya :

Tabel. Uraian gaya

P (kN)	P_x (kN)	P_y (kN)
P ₁ = 30	P _{x1} = 30 cos 30	P _{y1} = 30 sin 30
P ₂ = 30	P _{x2} = 30 cos 45	P _{y2} = -30 sin 45
P ₃ = 30	P _{x3} = 30 cos 90	P _{y3} = -30 sin 90
P ₄ = 30	P _{x4} = -30 cos 0	P _{y4} = 30 sin 0
P ₅ = 30	P _{x5} = -30 cos 60	P _{y5} = 30 sin 60
	$\sum P_x = 2,194$	$\sum P_y = -10,232$

Besarnya resultan gaya adalah :

$$R = \sqrt{(2,194)^2 + (-10,232)^2} = 10,465 \text{ kN}$$

b. Dengan arah : $tg \alpha = \frac{-10,465}{2,194}$

$$\alpha = 78^\circ 1' 6'' \quad \text{Ke kanan bawah, dan menangkap pada titik 0.}$$

2. a. Reaksi perletakan :

$$\sum M_B = 0 \rightarrow V_A \cdot 6 - 10.8.2 - 25.4 - 40.0 = 0$$

$$\rightarrow V_A = \frac{160 + 100}{6} = 43,33 \text{ kN.} (\uparrow)$$

$$\sum M_A = 0 \rightarrow -V_B \cdot 6 + 10.8.4 + 25.2 + 40.6 = 0$$

$$\rightarrow V_B = \frac{320 + 50 + 240}{6} = 101,67 \text{ kN.} (\uparrow)$$

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

$$V_A + V_B - qb - P = 0$$

$$43,33 + 101,67 - 10.8 - 25 - 40 = 0 \rightarrow \text{oke}$$

b. Gaya-gaya dalam (lintang dan momen) :

$$0 \leq x \leq 2m$$

$$L_x = V_A - q \cdot x$$

$$x = 0 \rightarrow L_0 = 43,33 - 10 \cdot 0 = 43,33kN$$

$$x = 1m \rightarrow L_1 = 43,33 - 10 \cdot 1 = 33,33kN$$

$$x = 2m \rightarrow L_2 = 43,33 - 10 \cdot 2 = 23,33kN$$

$$M_x = V_A \cdot x - 1/2 \cdot q \cdot x^2$$

$$x = 0m \rightarrow M_0 = 43,33 \cdot 0 - 1/2 \cdot 10 \cdot 0^2 = 0$$

$$x = 1m \rightarrow M_1 = 43,33 \cdot 1 - 1/2 \cdot 10 \cdot 1^2 = 38,33kNm$$

$$x = 2m \rightarrow M_2 = 43,33 \cdot 2 - 1/2 \cdot 10 \cdot 2^2 = 66,66kNm$$

$$2m \leq x \leq 6m$$

$$L_x = V_A - qx - P_1$$

$$x = 2m \rightarrow L_2 = 43,33 - 10 \cdot 2 - 25 = -1,67kN$$

$$x = 3m \rightarrow L_3 = 43,33 - 10 \cdot 3 - 25 = -11,67kN$$

$$x = 4m \rightarrow L_4 = 43,33 - 10 \cdot 4 - 25 = -21,67kN$$

$$x = 5m \rightarrow L_5 = 43,33 - 10 \cdot 5 - 25 = -31,67kN$$

$$x = 6m \rightarrow L_6 = 43,33 - 10 \cdot 6 - 25 = -41,67kN$$

$$M_x = V_A \cdot x - 1/2 \cdot q \cdot x^2 - P(x - a)$$

$$x = 2m \rightarrow M_2 = 43,33 \cdot 2 - 1/2 \cdot 10 \cdot 2^2 - 25(2 - 2) = 66,66kNm$$

$$x = 3m \rightarrow M_3 = 43,33 \cdot 3 - 1/2 \cdot 10 \cdot 3^2 - 25(3 - 2) = 59,99kNm$$

$$x = 4m \rightarrow M_4 = 43,33 \cdot 4 - 1/2 \cdot 10 \cdot 4^2 - 25(4 - 2) = 43,32kNm$$

$$x = 5m \rightarrow M_5 = 43,33 \cdot 5 - 1/2 \cdot 10 \cdot 5^2 - 25(5 - 2) = 16,65kNm$$

$$x = 6m \rightarrow M_6 = 43,33 \cdot 6 - 1/2 \cdot 10 \cdot 6^2 - 25(6 - 2) = -20kNm$$

$$6 \leq x \leq 8m$$

$$L_x = V_A - q \cdot x - P_1 + V_B - P_2$$

$$x = 6m \rightarrow L_0 = 43,33 - 10 \cdot 6 - 25 + 101,67 - 40 = 20kN$$

$$x = 7m \rightarrow L_1 = 43,33 - 10 \cdot 7 - 25 + 101,67 - 40 = 10kN$$

$$x = 8m \rightarrow L_2 = 43,33 - 10 \cdot 8 - 25 + 101,67 - 40 = 0kN$$

$$M_x = V_A \cdot x - 1/2 \cdot q \cdot x^2 - P(x-a) + V_B(x-L) - P(x-L)$$

$$x = 6m \rightarrow M_6 = 43,33 \cdot 6 - 1/2 \cdot 10 \cdot 6^2 - 25(6-2) + 101,67(6-6) - 40(6-6)$$

$$\dots\dots\dots = -20kNm$$

$$x = 7m \rightarrow M_7 = 43,33 \cdot 7 - 1/2 \cdot 10 \cdot 7^2 - 25(7-2) + 101,67(7-6) - 40(6-6)$$

$$\dots\dots\dots = -5kNm$$

$$x = 8m \rightarrow M_8 = 43,33 \cdot 8 - 1/2 \cdot 10 \cdot 8^2 - 25(8-2) + 101,67(8-6) + 40(8-6)$$

$$\dots\dots\dots = 0kNm$$

d. Gambar diagram gaya-gaya dalam :

