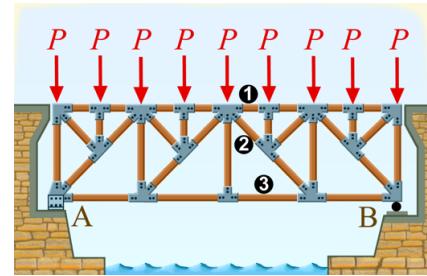


STATICS

Structural Analysis
Dr. Umit N. ARIBAS

Question : Determine the force in members 1, 2 and 3 of the deck truss bridge. All the acute angles are 45° and $P = 1\text{kN}$.



Solution :

Since there are three unknown support reactions and three equilibrium equations, the support reactions are obtained using the equilibrium equations as,

- $\sum M_A = 0$;

$$B_y(8e) - (1\text{kN})(e + 2e + 3e + 4e + 5e + 6e + 7e + 8e) = 0$$

$$B_y = 4.5\text{kN} \uparrow$$

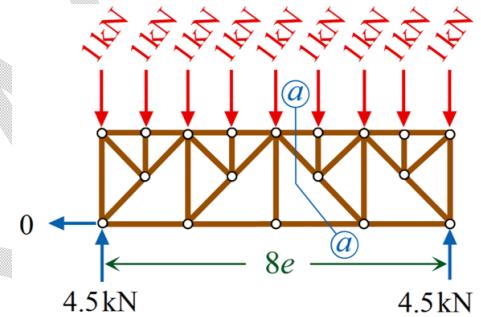
- $\sum F_y = 0$;

$$A_y + B_y - 9P = 0$$

$$A_y = 4.5\text{kN} \uparrow$$

- $\sum F_x = 0$;

$$A_x = 0$$



The method of sections,

First, we take a cut using the section a-a, the structural members coincide with this cut is replaced by their respective internal forces in the assumed direction. Next, the magnitudes and directions of the internal forces are obtained using the equilibrium equations as (3 unknown internal forces, 3 equilibrium equations):

- $\sum M_C = 0$; $S_3(2e) - (4.5\text{kN})(4e) + 1(e + 2e + 3e + 4e) = 0$

$$S_3 = 4\text{kN}$$

- $\sum F_y = 0$; $S_2 \sin 45^\circ - (4\text{kN}) + (4.5\text{kN}) = 0$

$$S_2 = -0.707\text{kN}$$

- $\sum M_D = 0$; $(4.5\text{kN})(2e) - (1\text{kN})(2e + e - e) + S_1(2e) = 0$

$$S_1 = -3.5\text{kN}$$

