STATICS

Equilibrium of a Rigid Body

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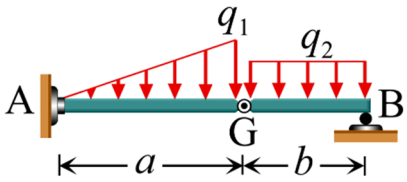
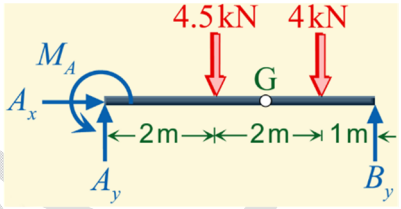
Question : Determine the support reactions and the connection forces of the compound beam. $q_1 = 3\,\text{kN/m}$, $q_2 = 2\,\text{kN/m}$, $a = 3\,\text{m}$ and $b = 2\,\text{m}$.



Solution :

Since there are three equilibrium equations and four unknowns, the compound beam has to be separated from the hinge,

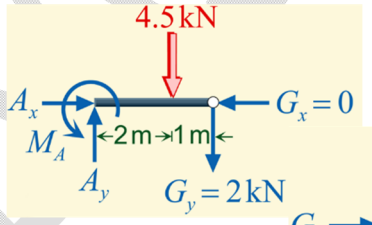


The right part:

$$\sum F_x = 0 \quad \Rightarrow \quad G_x = 0$$

$$\sum M_G = 0 \;;\; 1\times 4 - 2B_y = 0 \quad \Rightarrow \quad B_y = 2\,\text{kN}\uparrow$$

$$\sum F_y = 0 \;;\; G_y + B_y - 4 = 0 \quad \Rightarrow \quad G_y = 2\,\text{kN}$$



The left part:

$$\sum F_y = 0 \;;\; A_y - G_y - 4.5 = 0 \quad \Rightarrow \quad A_y = 6.5\,\text{kN}\uparrow$$

$$\sum M_A = 0 \;;\; 4.5\times 2 - M_A + 2\times 3 = 0 \quad \Rightarrow \quad M_A = 15\,\text{kNm}$$

$$\sum F_x = 0 \;; \quad \Rightarrow \quad A_x = 0$$