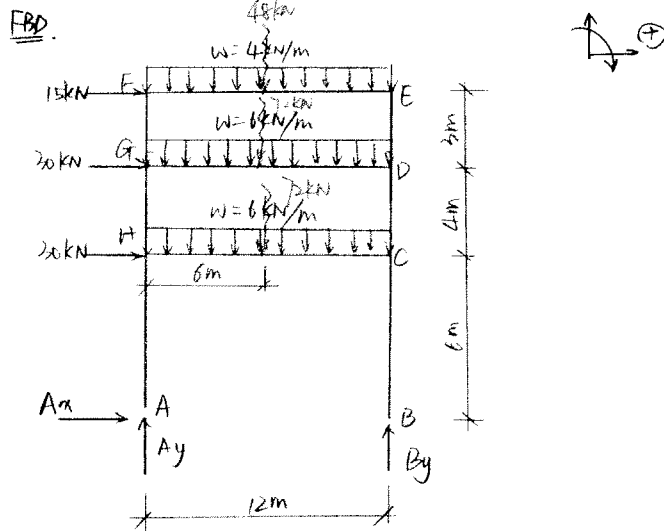


3.16 Determine all reactions. The uniform load on all girders extends to the centerlines of the columns.



There're 3 support reactions and we could list 3 equilibrium eqns easily.

$$\sum F(x) = 0 \quad 15 + 30 + 30 + A_x = 0$$

$$\sum F(y) = 0 \quad A_y + B_y - 48 \times 6 - 72 \times 6 - 66 \times 6 = 0$$

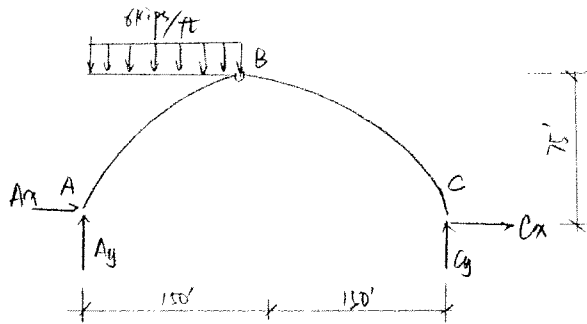
$$\sum M(A) = 0 \quad 15 \times (3 + 4 + 6) + 30 \times (4 + 6) + 30 \times 6 + 48 \times 6 + 72 \times 6 + 66 \times 6 - B_y \times 12 = 0$$

$$\Rightarrow \begin{cases} A_x = -75 \text{ kN} (\leftarrow) \\ A_y = 39.75 \text{ kN} (\uparrow) \\ B_y = 132.25 \text{ kN} (\uparrow) \end{cases} \parallel \text{Ans}_1$$

Then solve the prob. using RISA. Ans₂.

2.18 Determine all reactions.

FBD



The supports provide 4 reactions. Since three eqns of equilibrium are available for the entire structure, and hinge at B provide conditional eqn. The structure is determinate.

List 3 equilibrium eqns.

$$\sum F_x = 0 \quad A_x + C_x = 0$$

$$\sum F_y = 0 \quad A_y + C_y - 6 \times 150 = 0$$

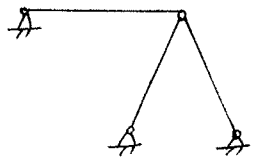
$$\sum M(A) = 0 \quad 6 \times 150 \times 75 - C_y \times 300 = 0$$

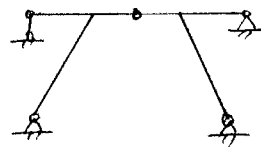
List 1 conditional eqn.

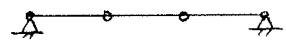
$$\sum M(B) = 0 \quad -C_y \times 150 - C_x \times 75 = 0$$

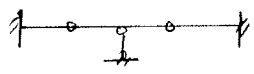
$$\Rightarrow \begin{cases} A_x = 450 \text{ kips } (\rightarrow) \\ A_y = 675 \text{ kips } (\uparrow) \\ C_x = -450 \text{ kips } (\leftarrow) \\ C_y = 225 \text{ kips } (\uparrow) \end{cases}$$

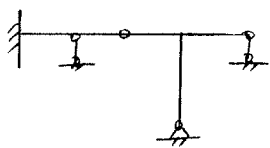
3.31 Classify the structures. Indicate if stable or unstable. If unstable, indicate the reason. If the structure is stable, indicate if determinate or indeterminate. If indeterminate, specify the degree.

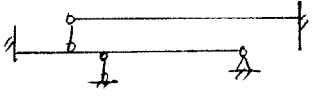
(a)  $R - (3 + C) = 2 \times 3 - (3 + 2) = 1^{\circ}$ stable, indeterminate.

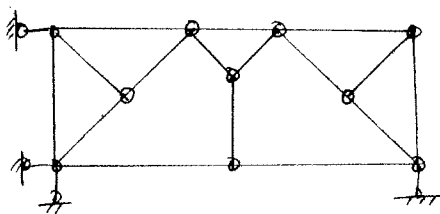
(b)  $R - (3 + C) = (1 + 2 \times 3) - (3 + 1) = 3^{\circ} > 0$
stable, indeterminate

(c)  $R - (3 + C) = 2 \times 2 - (3 + 2) = -1 < 0$
unstable.

(d)  $R - (3 + C) = (3 \times 2 + 1) - (3 + 2) = 2^{\circ} > 0$
stable, indeterminate

(e)  $R - (3 + C) = (3 + 2 + 1 \times 2) - (3 + 1) = 3^{\circ} > 0$
stable, indeterminate.

(f)  $R - (3 + C) = (3 \times 2 + 2 + 1) - (3 + 2) = 4^{\circ} > 0$
stable, indeterminate



stable, determinate