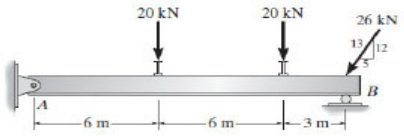
Problem 1:

2–18. Determine the reactions on the beam. Neglect the thickness of the beam.



$\zeta + \sum M_A = 0; \quad B_y(15) - 20(6) - 20(12) - 26\left(\frac{12}{13}\right)(15) = 0$

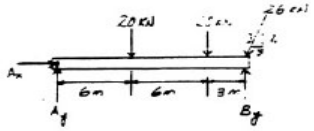
$B_y = 48.0 \text{ kN}$ **Ans.**

$+\uparrow \sum F_y = 0; \quad A_y + 48.0 - 20 - 20 - \frac{12}{13}(26) = 0$

$A_y = 16.0 \text{ kN}$ **Ans.**

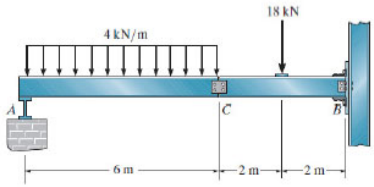
$\overset{+}{\rightarrow} \sum F_x = 0; \quad A_x - \left(\frac{5}{13}\right)26 = 0$

$A_x = 10.0 \text{ kN}$ **Ans.**



Problem 2:

2–21. Determine the reactions at the supports A and B of the compound beam. Assume there is a pin at C.



Equations of Equilibrium: First consider the FBD of segment AC in Fig. a. N_A and C_y can be determined directly by writing the moment equations of equilibrium about C and A respectively.

$\zeta + \sum M_C = 0; \quad 4(6)(3) - N_A(6) = 0 \quad N_A = 12 \text{ kN}$ **Ans.**

$\zeta + \sum M_A = 0; \quad C_y(6) - 4(6)(3) = 0 \quad C_y = 12 \text{ kN}$ **Ans.**

Then,

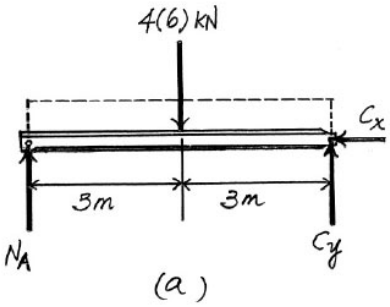
$\overset{+}{\rightarrow} \sum F_x = 0; \quad 0 - C_x = 0 \quad C_x = 0$

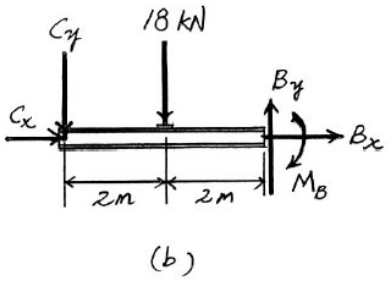
Using the FBD of segment CB, Fig. b,

$\overset{+}{\rightarrow} \sum F_x = 0; \quad 0 + B_x = 0 \quad B_x = 0$ **Ans.**

$+\uparrow \sum F_y = 0; \quad B_y - 12 - 18 = 0 \quad B_y = 30 \text{ kN}$ **Ans.**

$\zeta + \sum M_B = 0; \quad 12(4) + 18(2) - M_B = 0 \quad M_B = 84 \text{ kN} \cdot \text{m}$ **Ans.**





3)

a)

$m = 19, j = 16, r = 12$

for frame

Degree of static indeterminacy $= 3m - (3j - r)$

$= 3(19) - (3(16) - 12)$

$= 21$

b)

unstable — no reaction to resist a horizontal force on lower member