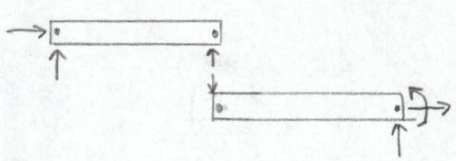
HOMEWORK 1 SOLUTIONS

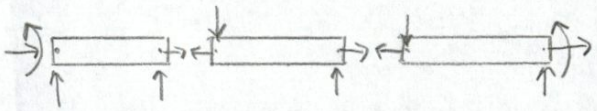
Problem 1:

a) 

$r = 6$ (6 reactions)

$n = 2$ (2 members) $\rightarrow 3n = 3(2) = 6$

$r = 3n$ Statically determinate (1 pt.)

b) 

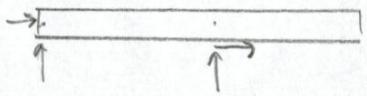
$r = 10$ (10 reactions)

$n = 3$ (3 members) $\rightarrow 3n = 3(3) = 9$

$r > 3n$

$r - 3n = 10 - 9 = 1$

Statically indeterminate to 1°. (1 pt.)

c) 

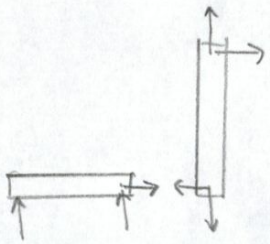
$r = 4$ (4 reactions)

$n = 1$ (1 member) $\rightarrow 3n = 3(1) = 3$

$r > 3n$

$r - 3n = 4 - 3 = 1$

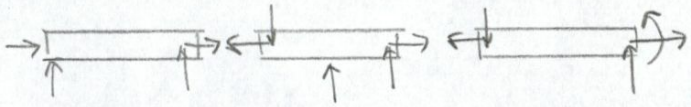
Statically indeterminate to 1° (1 pt.)

d) 

$r = 5$ (5 reactions)

$n = 2$ (2 members) $\rightarrow 3n = 3(2) = 6$

$r < 3n$ Unstable (1 pt.)

e) 

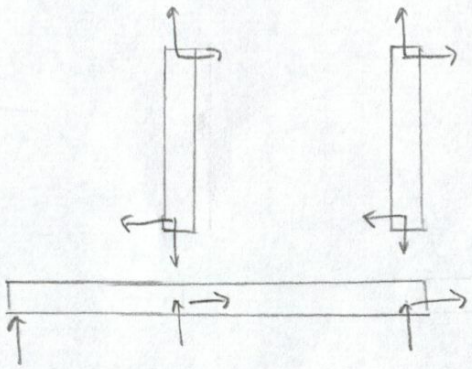
$r = 10$ (10 reactions)

$n = 3$ (3 members) $\rightarrow 3n = 3(3) = 9$

$r > 3n$

$3n - r = 10 - 9 = 1$

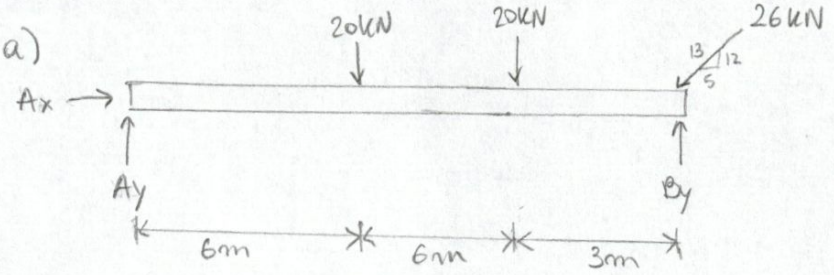
Statically indeterminate to 1° (1 pt.)

f) 

Since the rocker on the horizontal member can not resist a horizontal force component, the structure is unstable. (1 pt.)

Problem 2:

a)



(2 pt.)

$\circlearrowleft + \Sigma M_A = 0$

$-(20KN)(6m) - (20KN)(12m) + (26KN)\left(\frac{12}{13}\right)(15m) + B_y(15m) = 0$

$\underline{B_y = 48\,KN}$

$\uparrow + \Sigma F_y = 0$

$A_y + 48KN - 20KN - 20KN - 26KN\left(\frac{12}{13}\right) = 0$

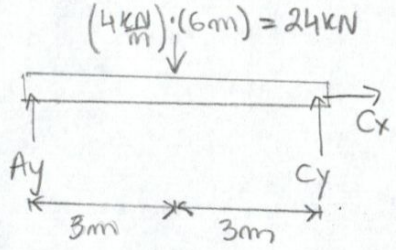
$\underline{A_y = 16\,KN}$

$\pm\rightarrow \Sigma F_x = 0$

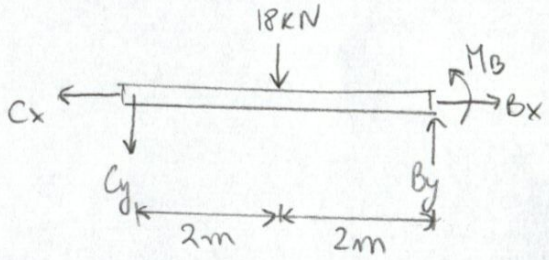
$A_x - (26KN)\left(\frac{5}{13}\right) = 0$

$\underline{A_x = 10KN}$

b)



Member 1



Member 2

(2 pt.)

$\circlearrowleft + \Sigma M_C = 0$

$-A_y(6m) + (24KN)(3m) = 0$

$\underline{A_y = 12\,KN}$

$\circlearrowleft + \Sigma M_A = 0$

$-(24KN)(3m) + C_y(6m) = 0$

$\underline{C_y = 12\,KN}$

$\pm\rightarrow \Sigma F_x = 0$

$\underline{C_x = 0}$

$\circlearrowleft + \Sigma M_B = 0$

$12KN(4m) + (18KN)(2m) + M_B = 0$

$\underline{M_B = -84\,KN}$

$+\uparrow \Sigma F_y = 0$

$-12KN - 18KN + B_y = 0$

$\underline{B_y = 30KN}$

$\pm\rightarrow \Sigma F_x = 0$

$0 + B_x = 0$

$\underline{B_x = 0}$