

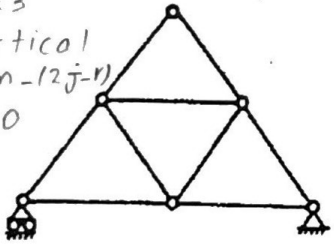
Homework 1

Due: 11:59 pm on February 19, 2024

Question 1: 10 points

Classify each of the structures as statically determinate, statically indeterminate, stable or unstable. For those cases that are indeterminate, specify the degree of indeterminacy.

$m = 9, j = 6, r = 3$
 Degree of statistical indeterminacy $= m - (2j - r)$
 $= 9 - (2(6) - 3) = 0$
 statically determinate and stable



$m = 15, j = 8, r = 4$
 Degree of statistical indeterminacy $= m - (2j - r)$
 $= 15 - (2(8) - 4) = 3$
 $m + r = 19 > 2j = 16 \rightarrow$ stable

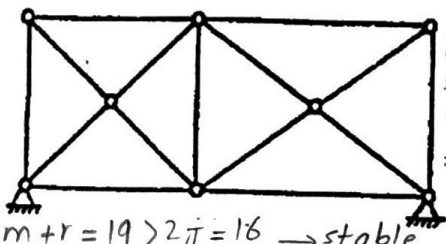
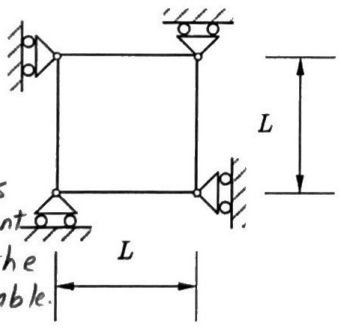


Figure 1:
(2.5)

Figure 2:
(2.5)

$m = 4, r = 4, j = 4$
 $m + r = 2j = 8$
 statically determinate
 The reactions are not concurrent at a point, so the structure is stable.



$n = 2$ parts
 $r = 8$ reactions
 $r - 3n = 2$ degree of statistical indeterminacy
 The reactions are nonconcurrent and nonparallel, so the structure is stable.

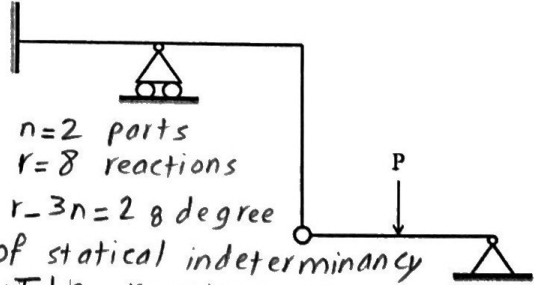


Figure 3:
(2.5)

Figure 4:
(2.5)

Question 2: 10 points

Determine the reactions on the structures below.

$$\sum F_x = 0 \Rightarrow A_x = 21.6 \text{ kips}$$

$$\sum M_A = 0 \Rightarrow 12(8) + 12(16) + 28.8(20) - D_y(20) = 0 \Rightarrow D_y = 43.2 \text{ kips}$$

$$\sum F_y = 0 \Rightarrow A_y + D_y - 12 - 12 - 28.8 = 0$$

$$\Rightarrow A_y = 9.6 \text{ kips}$$

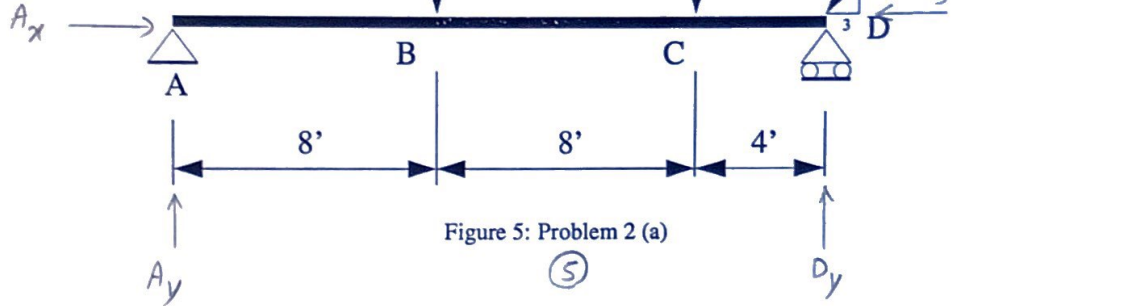


Figure 5: Problem 2 (a)

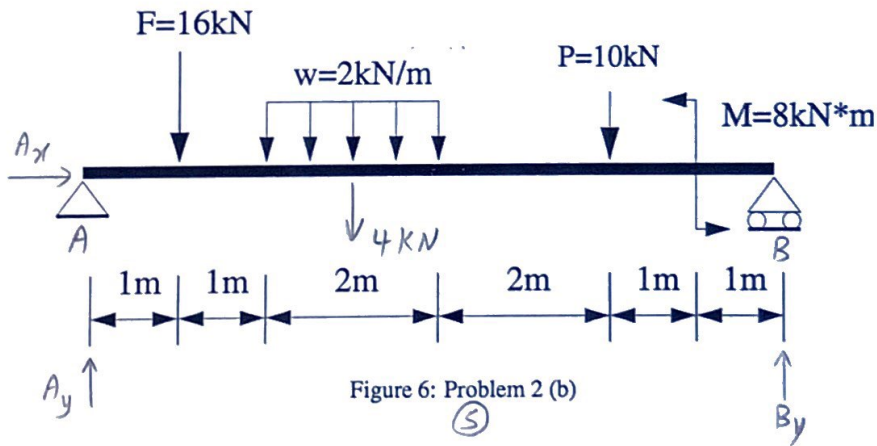


Figure 6: Problem 2 (b)

$$\sum M_A = 0 \Rightarrow 16(1) + 4(3) + 10(6) - 8 - B_y(8) = 0 \Rightarrow B_y = 10 \text{ kN}$$

$$\sum F_y = 0 \Rightarrow A_y - 16 - 4 - 10 + 10 = 0 \Rightarrow A_y = 20 \text{ kN}$$

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