

## Solutions to Homework 1

### 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**

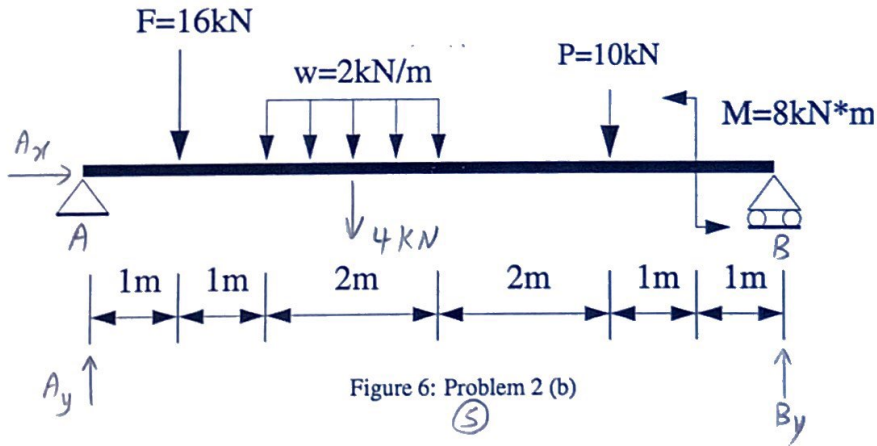
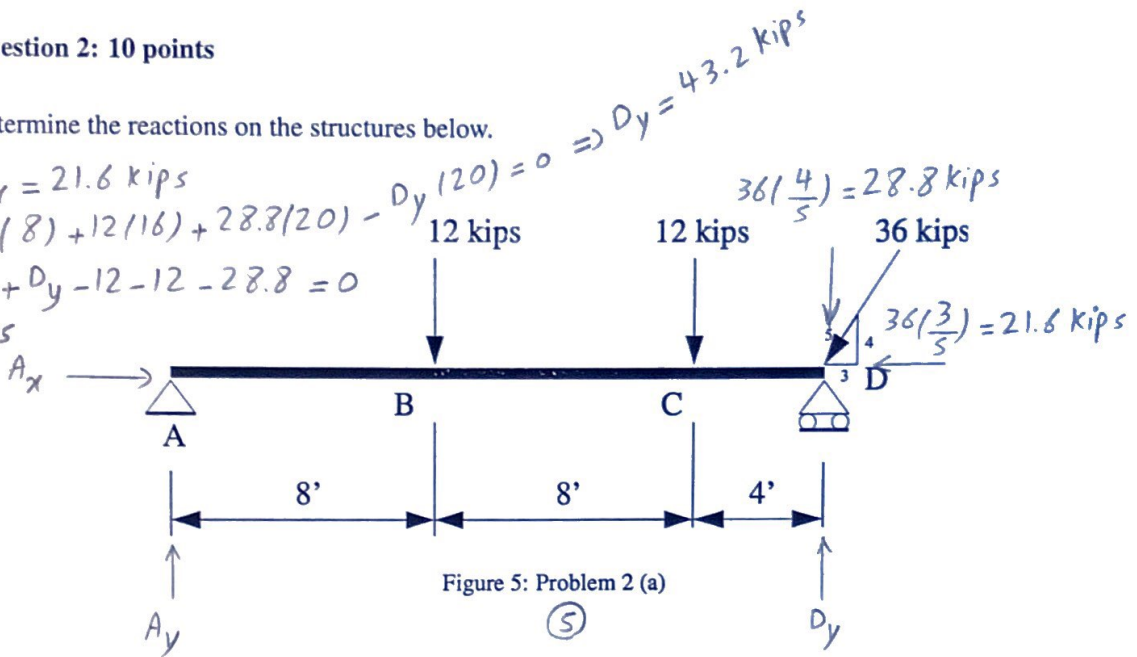
Determine the reactions on the structures below.

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

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

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

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



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

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

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