Mechanics of rigid bodies 1

Series 1. Statics

Exercise 1

Two cables are tied together at C and are loaded as shown in **figure 1**. Knowing that $P = 500\ N$ and $\alpha = 60°$, determine the tension in in cable AC and in cable BC.

Exercise 2

A rectangular plate is supported by three cables as shown in **figure 2**. Knowing that the tension in cable AD is $520\ N$, determine the weight of the plate

Exercise 3

A lever AB is hinged at C and attached to a control cable at A as shown in **figure 3**. If the lever is subjected to a $500N$ horizontal force at B, draw the free-body diagram needed to determine the tension in the cable and the reaction at C.

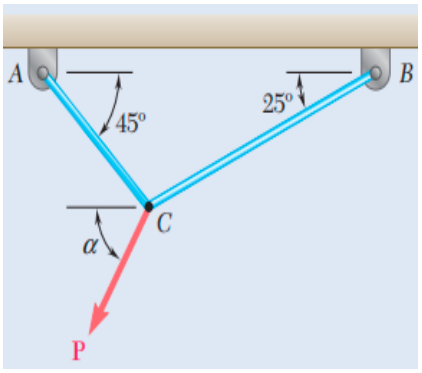

Figure 1

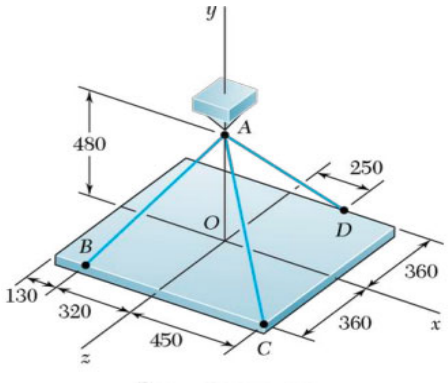

Figure 2

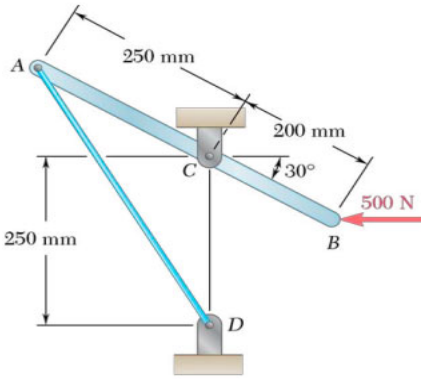

Figure 3

Exercise 4

Bar AC supports two $400\ N$ loads as shown in **figure 4**. Rollers at A and C rest against frictionless surfaces and a cable BD is attached at B. Determine the tension in cable BD, the reaction at A and the reaction at C.

Exercise 05

The maximum allowable value of each of the reactions is $180\ N$. Neglecting the weight of the beam (Figure 5), determine the range of the distance d for which the beam is safe.

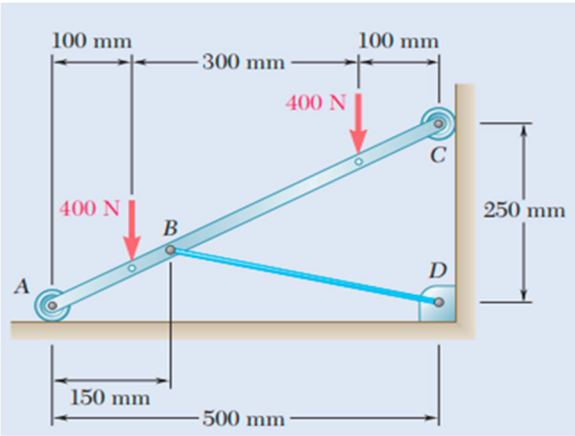

Figure 4

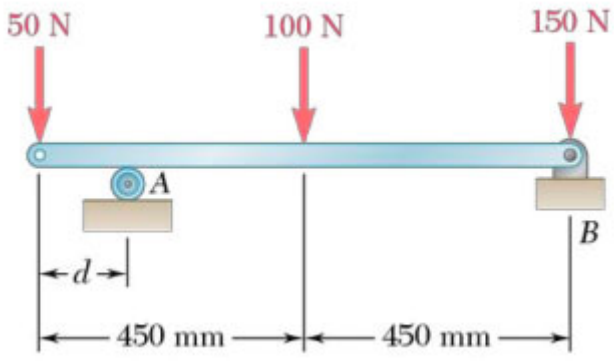

Figure 5

Exercise 6

A $3m$ boom is acted upon by the 4 kN force shown in **figure6**. Determine the tension in each cable and the reaction at the ball-and-socket joint at A.

Exercise 7

Two $150-mm$-diameter pulleys are mounted on line shaft AD (**Figure 7**). The belts at B and C lie in vertical planes parallel to the yz plane. Replace the belt forces shown with an equivalent force-couple system at A.

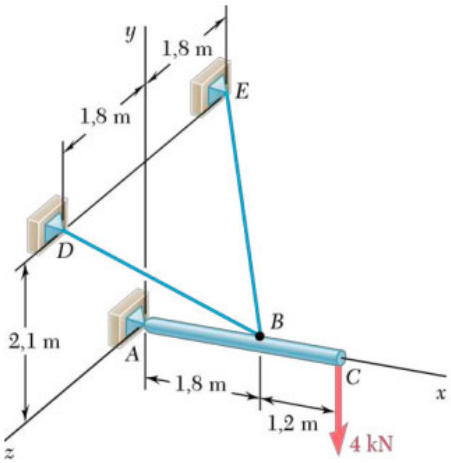

Figure 6

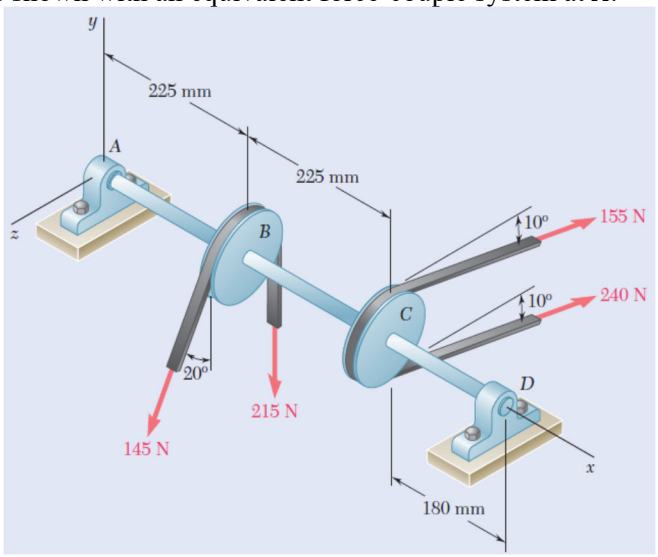

Figure. 7

Exercise 8

Two bars AB and BC, with respective weights P_1 and P_2, are pinned at point B and hinged at points A and C (Figure 8). Both bars are inclined at 45° relative to the horizontal. A moment M of known intensity is applied at point A. With: $P_1 = P$, $P_2 = \sqrt{2}P$, and $M = L\,P_2$.
Determine the reactions at joints A, B, and C.

Exercise 9

Two bars AC and BC are fixed to the wall at point A and simply supported at point B, the two bars are pinned to each other at point C (figure 9). A crane weighing $Q = 50\,kN$ and carrying a load with a weight $P = 1\,kN$. The center of gravity of the crane is located on the vertical axis CD. Neglecting the weight of the two bars, data: $a = 1\,m, b = 4\,m, c = 8\,m, d = 2\,m$. Determine the reactions at supports A and B.

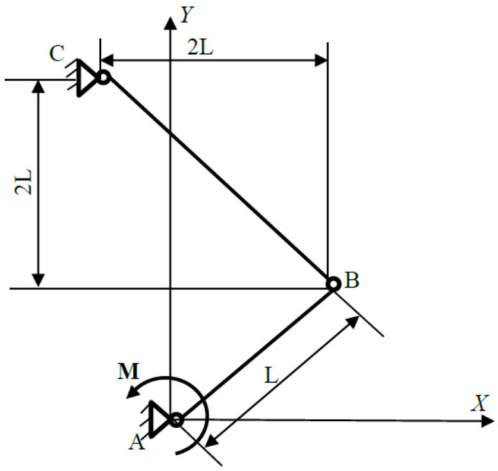

Figure 8

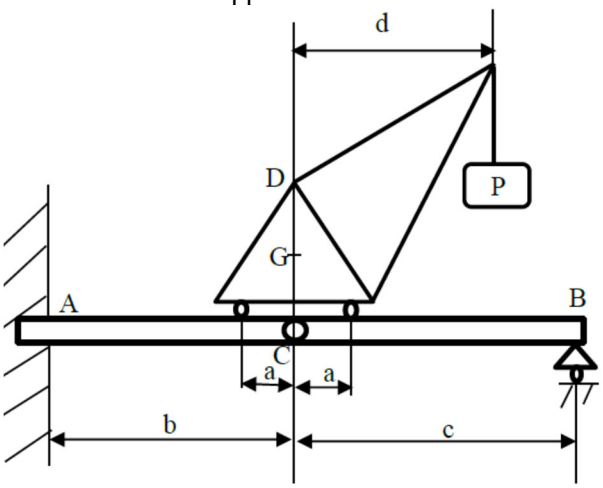

Figure. 9