

CE 201 STATICS (Sections 4 & 6)

First Semester 1429-30 / 2008-09 (081)

H.W. # 11

**Due** on Tuesday 23-1-1430 / 20-1-2009 (any time)

**Deadline** for submission: **Wednesday 24-1-1430 / 21-1-2009 (before you sit in class)**

- 1- The weight of the box, shown in Fig. P1, is  $W = 30$  kN, and the force  $F$  is perpendicular to the inclined surface. The coefficient of static friction between the box and the inclined surface is  $\mu_s = 0.2$ .
- (a) If  $F = 30$  kN, what is the magnitude of the friction force exerted on the box?  
(b) If  $F = 10$  kN, show that the box cannot remain at rest on the inclined surface.  
[Secs. 8.1 & 8.2] (20 pts.)
- 2- The coefficient of static friction between the two boxes, shown in Fig. P2, and between the lower box and the inclined surface is  $\mu_s$ . What is the largest force  $F$  that will not cause the boxes to slip?  
*Hint:  $F = f_c W, \alpha, \mu_s$*   
[Secs. 8.1 & 8.2] (15 pts.)
- 3- Blocks  $A$  and  $B$ , shown in Fig. P3, are connected by a horizontal bar. The coefficient of static friction between the inclined surface and the 400-kN block  $A$  is 0.3. The coefficient of static friction between the surface and the 300-kN block  $B$  is 0.5. What is the range of the values of the force  $F$  for which the blocks will remain in statical equilibrium?  
[Secs. 8.1 & 8.2] (25 pts.)
- 4- The 20-kN object, shown in Fig. P4, is supported at  $A$  and  $B$ . The coefficients of static friction at  $A$  and  $B$  are 0.4 and 0.36, respectively. What is the largest value of  $h$  for which the object will slip before it tips over?  
[Secs. 8.1 & 8.2] (15 pts.)
- 5- The mass of the vehicle, shown in Fig. P5, is 900 kg; it has rear-wheel drive, and the coefficient of static friction between its tires and the surface is 0.65. The coefficient of static friction between the crate and the surface is 0.4. If the vehicle attempts to pull the crate up the incline, what is the largest value of the mass of the crate for which it will slip up the incline before the vehicle's tires slip? [Secs. 8.1 & 8.2] (25 pts.)

**Very Important Note: it is NOT enough to solve 5 problems in this subject!!!! You need to practice and solve many others in order to fully understand FRICTION, as there are many different applications!!!**

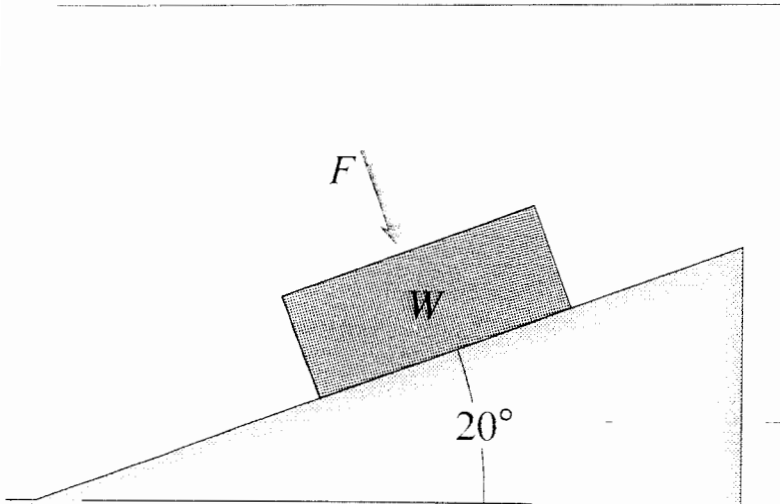


Fig. P1

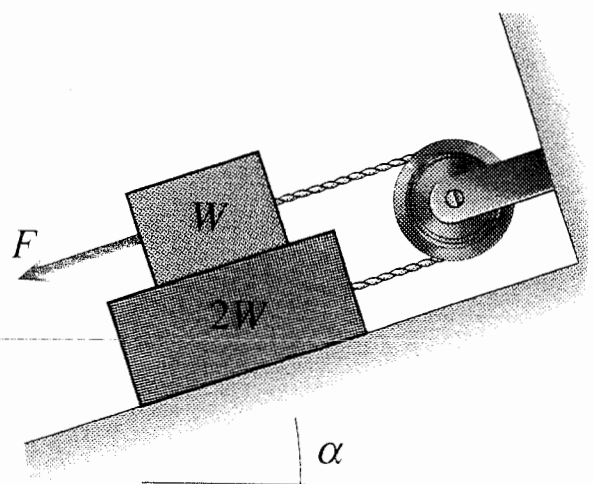


Fig. P2

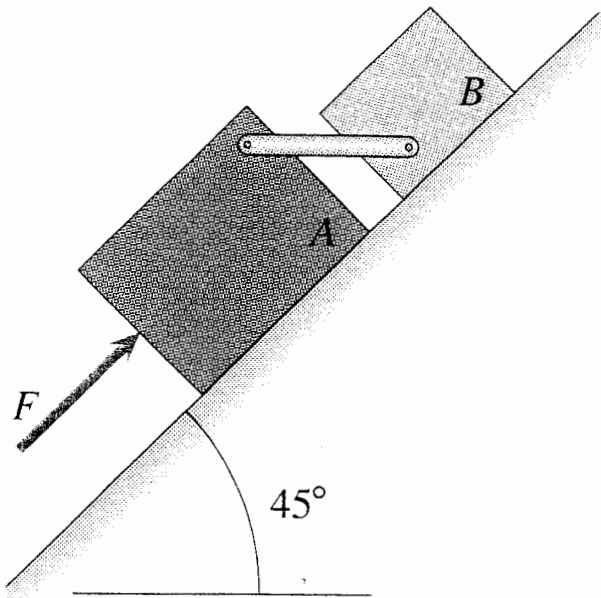


Fig. P3

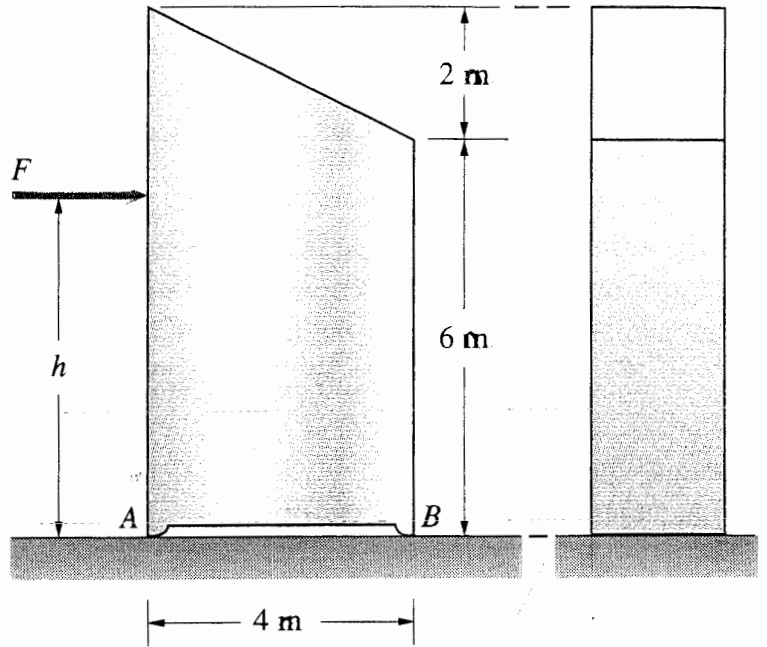


Fig. P4

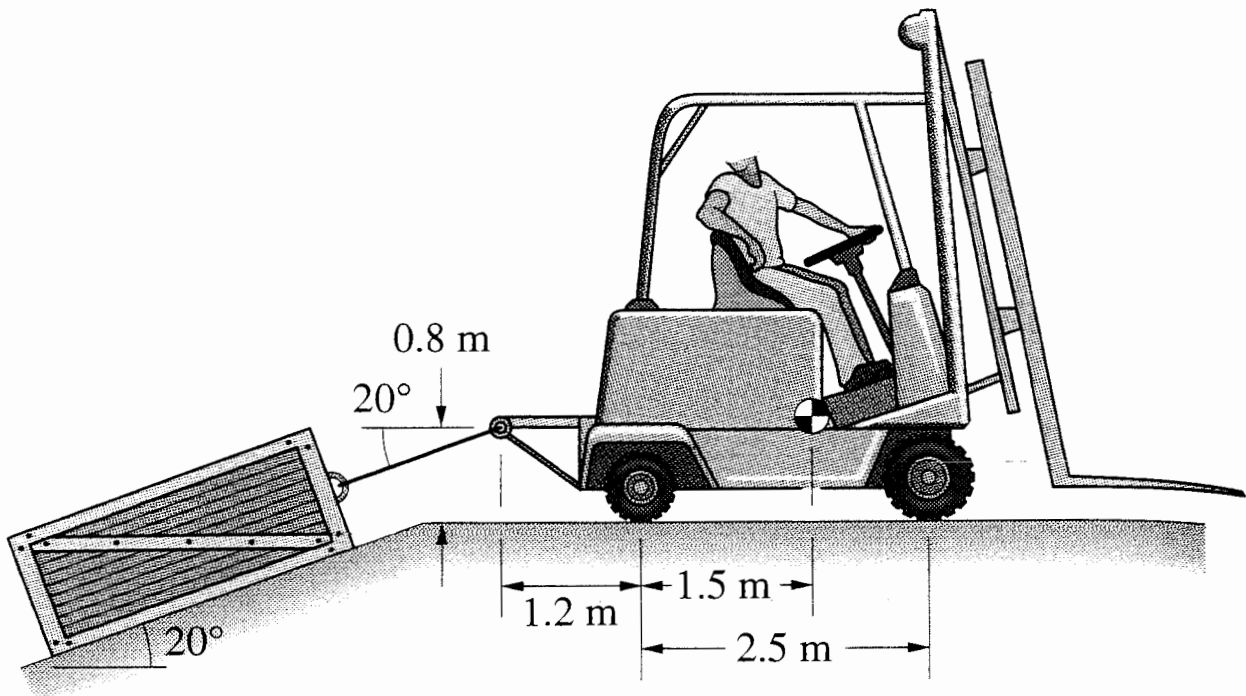


Fig. P5

Do your work yourself!! Remember that the homework carries about 15% of the course grade; in addition, *solving it is the best way to understand the subject.* Of course, you can seek my help anytime in the homework as well as in anything else.

As an engineer, review the guidelines for submitting homework assignments given to you in class BEFORE you start solving and writing the homework. FOLLOW ALL THESE GUIDELINES. Cheating, copying, etc. is .....!!!!!!