

King Fahd University of Petroleum & Minerals
CIVIL ENGINEERING DEPARTMENT

CE 201 STATICS (Sections 4 & 5)

First Semester 1428-29 / 2007-08 (071)

H.W. # 11

Due on Sunday 27-12-1428 / 6-1-2008 (any time)

Deadline for submission: **Monday 28-12-1428 / 7-1-2008 (before you sit in class)**

- 1- Two packages are placed on a conveyor belt which is at rest as shown in Fig. P1. Between the belt and package *A* the coefficients of friction are $\mu_s = 0.2$ and $\mu_k = 0.15$; between package *B* and the belt the coefficients are $\mu_s = 0.3$ and $\mu_k = 0.25$. The packages are placed on the belt so that they are in contact with each other and at rest. Determine
- whether either, or both, of the packages will move,
 - the friction force acting on each package.
- [Secs. 8.1, 8.2] (15 pts.)
- 2- The 20-lb block shown in Fig. P2 rests on a conveyor belt and is attached to the link *AB*. Knowing that the coefficient of static friction between the block and the belt is 0.25 and neglecting the weight of the link, determine the magnitude of the force **P** required to move the belt to the left. [Secs. 8.1, 8.2] (15 pts.)
- 3- A packing crate of mass 30 kg is pulled by a rope as shown in Fig. P3. The coefficient of static friction between the crate and the floor is 0.35. If $\alpha = 30^\circ$, determine
- the tension *T* required to move the crate,
 - whether the crate will slide or tip.
- [Secs. 8.1, 8.2] (20 pts.)
- 4- The coefficient of static friction between the 3000-lb car's tires and the road, shown in Fig. P4, is $\mu_s = 0.5$. Determine the steepest grade (the largest value of the angle α) the car can drive up at constant speed if the car has:
- rear-wheel drive;
 - front-wheel drive;
 - four-wheel drive.
- [Secs. 8.1, 8.2] (20 pts.)
- 5- Two identical uniform boards, each of mass 20 kg, are temporarily leaned against each other as shown in Fig. P5. Knowing that the coefficient of static friction between all surfaces is 0.40, determine
- the largest magnitude of the force **P** for which equilibrium will be maintained,
 - the surface at which motion will impend.
- [Secs. 8.1, 8.2] (30 pts.)

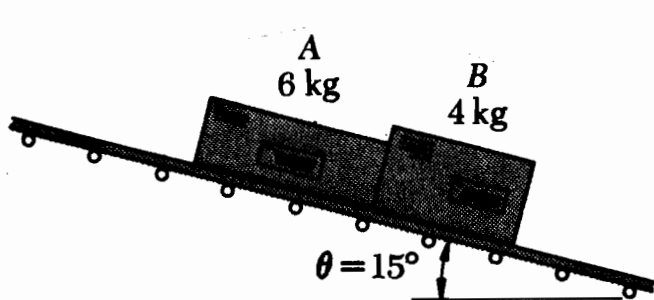


Fig. P1

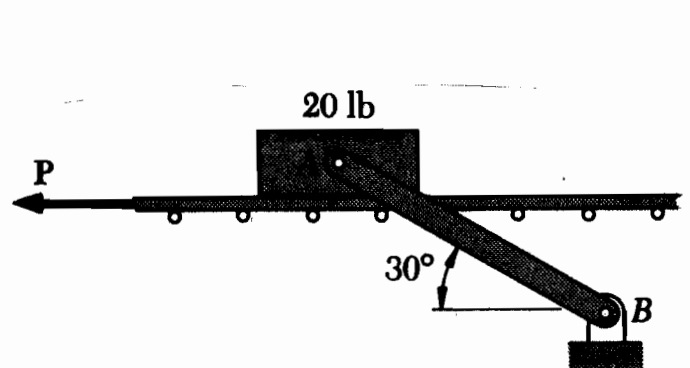


Fig. P2

Do your work yourself!! Remember that the homework carries 20% 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. **DO NOT** SUBMIT THE HOMEWORK IF YOU DO NOT FOLLOW ALL THESE GUIDELINES. Cheating, copying, etc. is!!!!!!

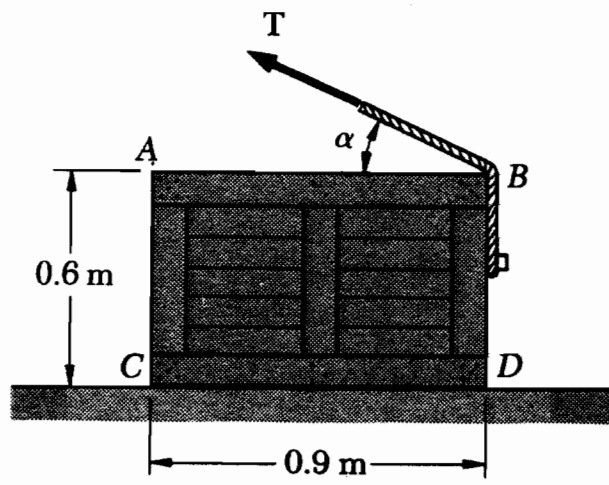


Fig. P3

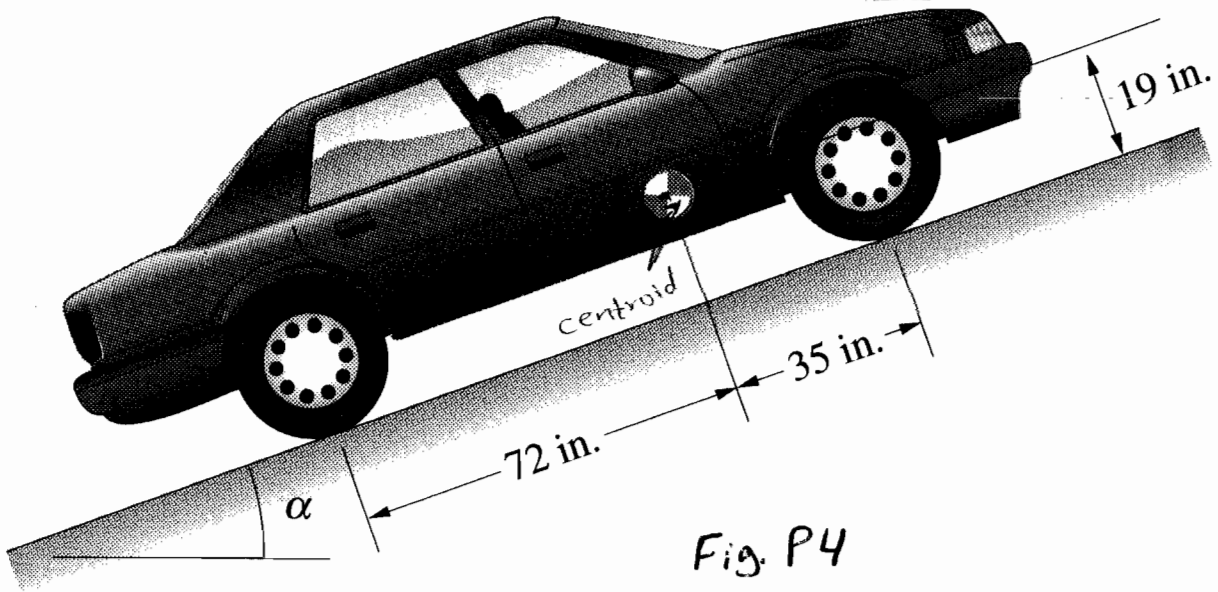


Fig. P4

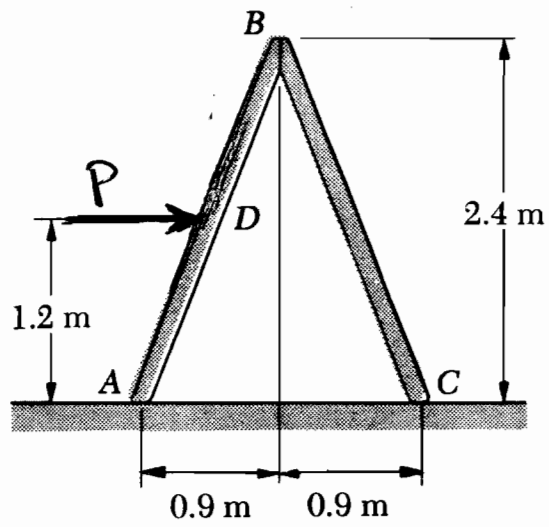


Fig. P5