King Fahd University of Petroleum & Minerals
CIVIL ENGINEERING DEPARTMENT

CE 201 STATICS (Sections 3 & 4)

First Semester 1430-31 / 2009-10 (**091**)

H.W. # 6

Due on Sunday 27-11-1430 / 15-11-2009 **(any time)**

Deadline for submission: **Monday 28-11-1430 / 16-11-2009** (**before you sit in class**)

1- Two systems of forces and moments act on the rectangular plate shown in Fig. P1. Are they equivalent? ***Prove!*** [Secs. 4.7, 4.8] (15 pts.)

2- Two systems of forces and moments are shown in Fig. P2, where

$\mathbf{F}_A = -10\mathbf{i} + 10\mathbf{j} - 15\mathbf{k}$ (kN),
$\mathbf{F}_B = 30\mathbf{i} + 5\mathbf{j} + 10\mathbf{k}$ (kN),
$\mathbf{M} = -90\mathbf{i} + 150\mathbf{j} + 60\mathbf{k}$ (kN. m),
$\mathbf{F}_C = 10\mathbf{i} - 5\mathbf{j} + 5\mathbf{k}$ (kN),
$\mathbf{F}_D = 10\mathbf{i} + 20\mathbf{j} - 10\mathbf{k}$ (kN).

Are they equivalent? ***Prove!*** [Secs. 4.7, 4.8] (25 pts.)

3- The thrust forces exerted on the airplane by its four engines, shown in Fig. P3, are parallel to the *x* axis. Their magnitudes are

engine 1: 160 kN,
engine 2: 175 kN,
engine 3: 185 kN,
engine 4: 160 kN.

(a) Represent the four thrust forces by a force **F**. What is **F**, and where does its line of action intersect the *y* axis?

(b) The pilot wants to adjust the thrust of engine 1 so that the four thrust forces can be represented by a force acting at the origin. What is the necessary thrust of engine 1? [Secs. 4.7, 4.8] (20 pts.)

4- The aerodynamic lift of the wing, shown in Fig. P4, is described by the distributed load

$$w = -300\sqrt{1 - 0.04\,x^2}\ \ N/m.$$

Determine the magnitude and location of the resultant of this distributed load. [Sec. 4.10] (20 pts.)

5- Replace the loading shown in Fig. P5 by an equivalent resultant force and couple moment acting at point *B*. [Sec. 4.10] (20 pts.)

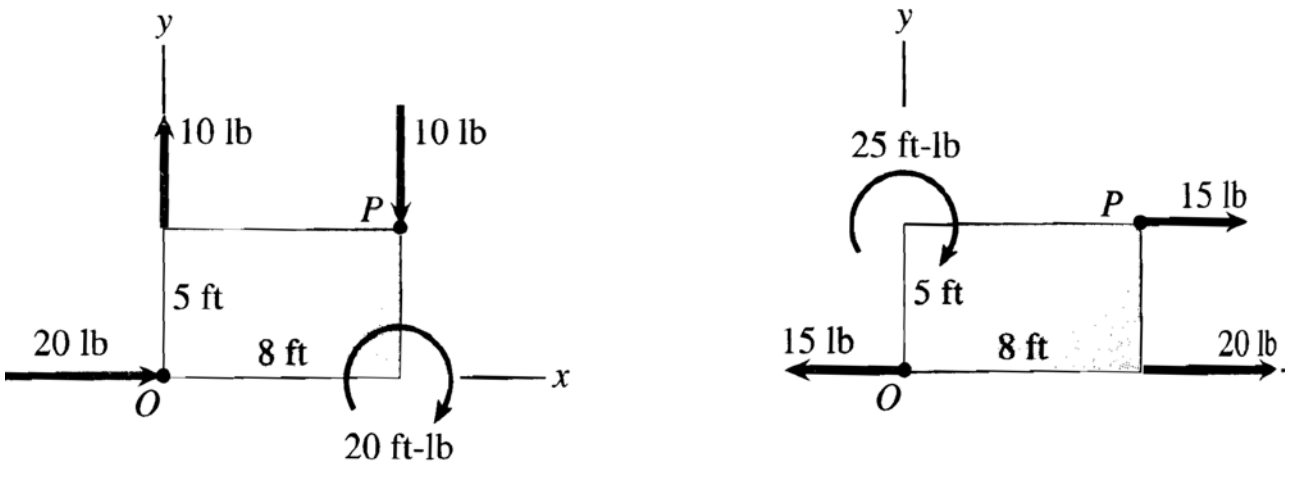
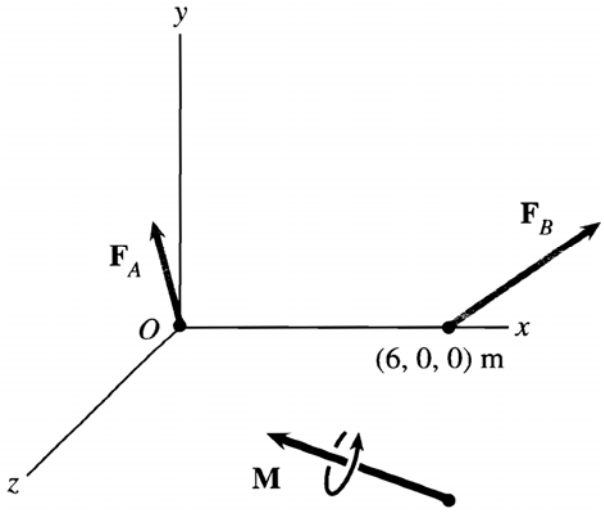


Fig. P1

System 1



System 2

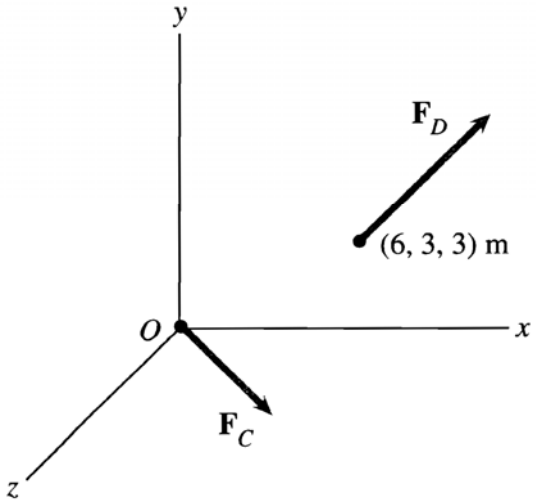


Fig. P2

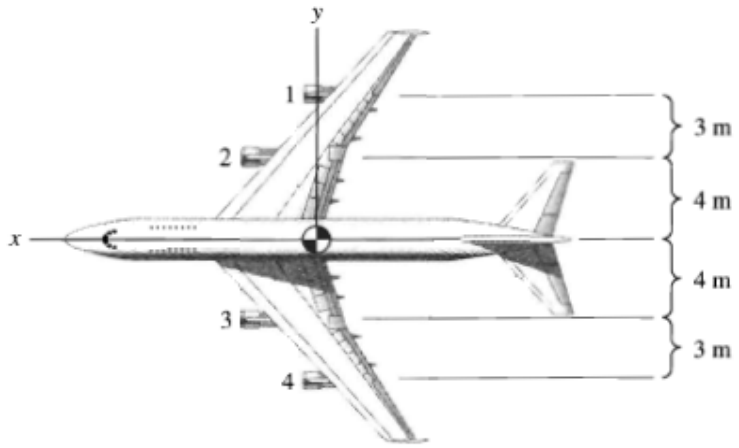


Fig. P3

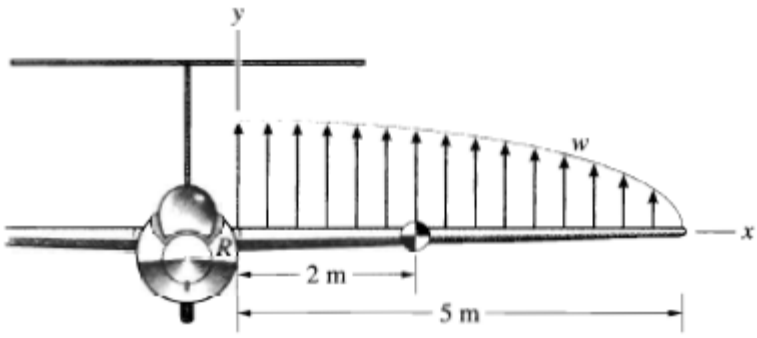


Fig. P4

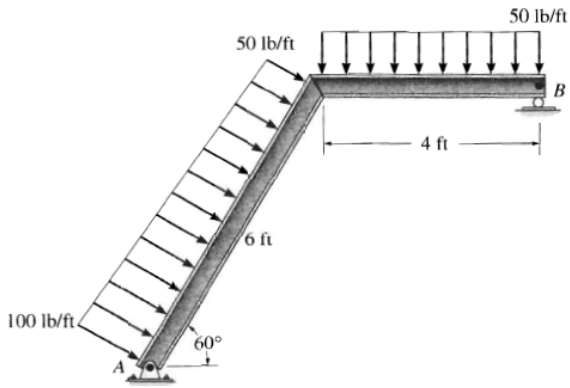


Fig. P5

Do <u>your</u> work *<u>yourself</u>*!! Remember that the homework carries more than 10% 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 <u>engineer</u>*, review the <u>guidelines for submitting homework assignments</u> given to you in class <u>BEFORE</u> you start solving and writing the homework. FOLLOW *<u>ALL</u>* THESE GUIDELINES. *<u>Cheating, copying, etc. is …….!!!!!!</u>