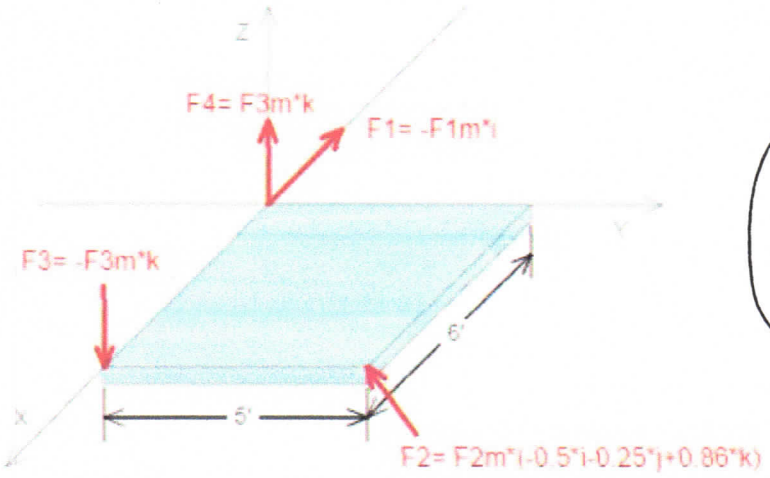
SOLUTION

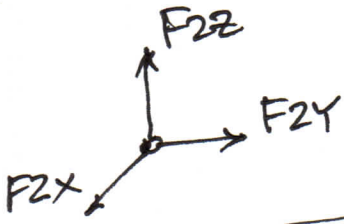
ip4STATICS Worksheet for U04_3d_P02

The base plate shown below carries four force loads.

Instance variables: forces F1, F2, F3 and F4 in lbs.



Note. F2 formally is



Note. (a = 3, b = 2.5)

(1) What is the resultant force FR(i,j,k)?

(2) What is the resultant moment MO(i,j,k) about the origin?

(3) Consider point P at (a,b,0). What is the resultant force FP(i,j,k)?

(4) What is the resultant moment MP(i,j,k) about point P?

$$FRx = F1x + F2x = -F1m - 0.5 \cdot F2m$$
$$FRY = F2Y = -0.25 \cdot F2m$$
$$FRz = F2z + F3z + F4z = +0.86 \cdot F2m$$

(1) $FR = (-F1m - 0.5 \cdot F2m)\bar{i} + (-0.25 \cdot F2m)\bar{j} + (0.86 \cdot F2m)\bar{k}$

$$MOx = 5 \cdot F2z = 5 \times 0.86 \cdot F2m$$
$$MOY = 6 \cdot F3m - 6 \cdot F2z = 6 \cdot F3m + 6 \cdot 0.25 F2m$$
$$MOz = -5 \cdot F2x + 6 \cdot F2Y = 5 \cdot 0.5 \cdot F2m - 6 \cdot 0.25 F2m$$
$$= 1 \cdot F2m$$

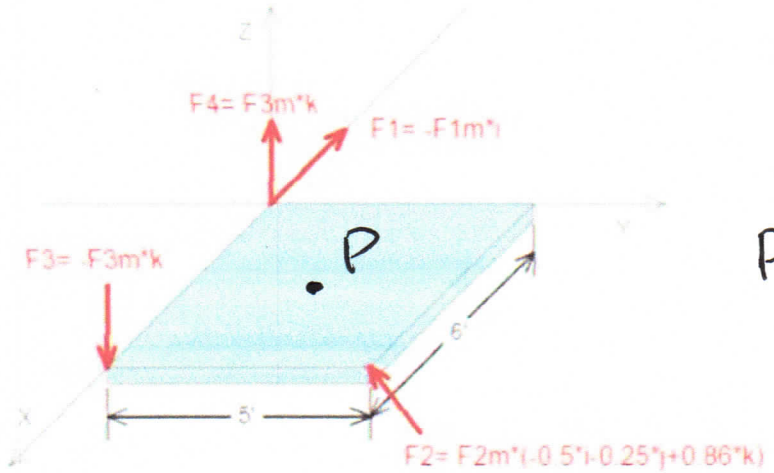
(2) $MO = 4.3 \cdot F2m\,\bar{i} + (1.5 \cdot F2m + 6 \cdot F3m)\bar{j} + (1 \cdot F2m)\bar{k}$

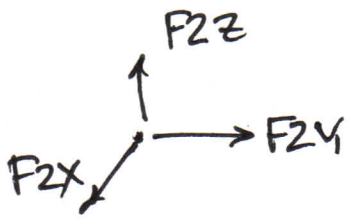
SOLUTION p.2

ip4STATICS Worksheet for U04_3d_P02

The base plate shown below carries four force loads.

Instance variables: forces F1, F2, F3 and F4 in lbs.





P(3, 2.5, 0)

$$\begin{cases} F2X = -0.5\,F2m \\ F2Y = -0.25\,F2m \\ F2Z = 0.86\,F2m \end{cases}$$

(1) What is the resultant force FR(i,j,k)?

(2) What is the resultant moment MO(i,j,k) about the origin?

(3) Consider point P at (a,b,0). What is the resultant force FP(i,j,k)? (a=3, b=2.5)

(4) What is the resultant moment MP(i,j,k) about point P?

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(3) FP(i,j,k) = FR(i,j,k), since resultant force is not referenced to a point. (See part (1)).

$$MPx = 2.5 \cdot F2z = 2.5 \cdot 0.86 \cdot F2m = 2.15 \cdot F2m$$

$$MPy = 6 \cdot F3m - 3 \cdot F2z = 6 \cdot F3m - 2.58\,F2m$$

$$MPz = -2.5\,F2x + 3 \cdot F2y = 1.25\,F2m - 0.75\,F2m = 0.5 \cdot F2m$$

(4) $MP(i,j,k) = (2.15 \cdot F2m)\,\bar{i} + (6 \cdot F3m - 2.58\,F2m)\,\bar{j} + (0.5 \cdot F2m)\,\bar{k}$