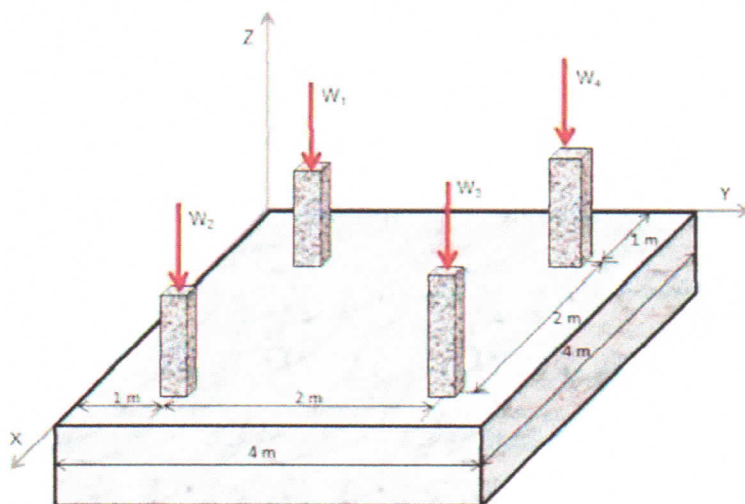


ip4STATICS Worksheet for U04_3d_P03

The foundation shown below carries four loads, one applied through each column.

Instance variables: W_1 , W_2 , W_3 and W_4 in kN.



- (1) What is the resultant force $FR(ijk)$?
- (2) What is the resultant moment $MO(ijk)$ about the origin?
- (3) Where is point $R(ijk)$ that causes FR to generate a moment equivalent to MO ?

$$(1) \begin{cases} FR_x = 0 \\ FR_y = 0 \\ FR_z = -1 \times (W_1 + W_2 + W_3 + W_4) \end{cases}$$

$$FR = 0 \cdot \bar{i} + 0 \cdot \bar{j} + (FR_z) \cdot \bar{k}$$

$$(2) \begin{cases} M_{xx} = -1 \cdot W_1 - 1 \cdot W_2 - 3 \cdot W_3 - 3 \cdot W_4 \\ M_{yy} = +1 \cdot W_1 + 3 \cdot W_2 + 3 \cdot W_3 + 1 \cdot W_4 \\ M_{zz} = 0 \end{cases}$$

$$MO = (M_{xx}) \bar{i} + (M_{yy}) \bar{j} + 0 \cdot \bar{k}$$

$$(3) \quad x_{FR} \cdot |FR| = M_{yy}; \quad x_{FR} = M_{yy}/|FR|$$

$$y_{FR} \cdot |FR| = M_{xx}; \quad y_{FR} = -M_{xx}/|FR|$$

$$\text{where } |FR| = \text{Sqrt}(FR_z^2) = (w_1 + w_2 + w_3 + w_4)$$

$$z_{FR} = 0.$$

$$\therefore R = (x_{FR})\vec{i} + (y_{FR})\vec{j} + 0.\vec{k}$$
