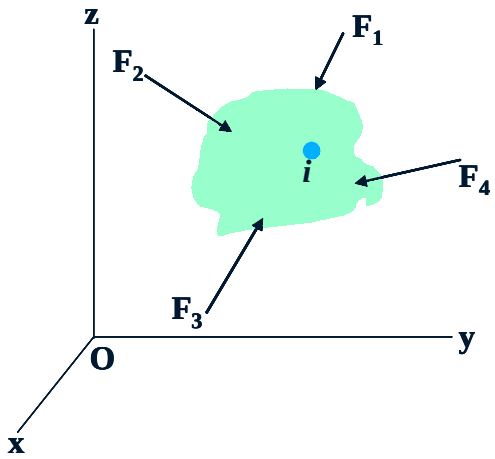
Equilibrium of rigid bodies: Part 1

Static equilibrium:

A body or part of it (shown in Fig. 1) which is currently stationary or moving with a constant velocity will remain in its status, if the resultant force and resultant moment are zero for all the forces and couples applied on it.



So:
Thus *equations of equilibrium* for a rigid body are:

$$\sum \mathbf{F} = \mathbf{0}$$

$$\sum \mathbf{M}_O = \mathbf{0}$$

Free body diagram for rigid bodies:

In order to draw the FBD for each member of a rigid body follow the instructions below:

- Isolate the object from its surroundings,
- Draw the outline of the object; consider all dimensions and angles,
- Include all forces and couple moments that the surroundings exert on the body. Forces include *loadings*, *support reactions* and *weights*. (See the support reaction section for detailed explanation)
- Known forces and moments should be labeled with their proper *magnitudes* and *directions*.
- Magnitudes and direction angles of unknown forces and moments should be represented with *letters*.

Example:

Draw the FBD for the following beam:
A pin can be considered for support *A* ,
A roller can be considered for support *B*,
Weight of the beam is generally neglected when it is small compared to the load the beam supports (or has not been mentioned).

The FBD is: