

## 3.8: Torque

Notation:

- $\tau_C$  = vector sum of all the torques about C.
- $\tau$  = vector sum of all the torques about the origin O.
- $\mathbf{F}$  = vector sum of all the external forces.

### Theorem

$$\tau = \tau_C + \bar{\mathbf{r}} \times \mathbf{F}$$

Thus:

$$\tau = \sum \mathbf{r}_i \times \mathbf{F}_i = \sum (\mathbf{r}'_i + \bar{\mathbf{r}}) \times \mathbf{F}_i \quad (3.8.1)$$

$$= \sum \mathbf{r}'_i \times \mathbf{F}_i + \bar{\mathbf{r}} \sum \mathbf{F}_i \quad (3.8.2)$$

therefore

$$\tau = \tau_C + \bar{\mathbf{r}} \times \mathbf{F}$$

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