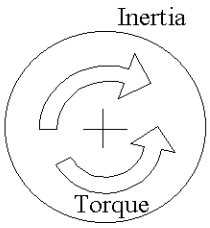
Chapter 13

Kinetics:
Angular Motion



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Angular Inertia

- Dynamic Equilibrium
- Moment Equations
- Determine Inertial Forces
- Determine accelerations
- Mass at center of rotation

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Kinetics

- The study of unbalanced forces
- Now use angular linear motion
- Linear ($F = ma$) Angular ($t = I_C\alpha$)
  - t = torque
  - I_C = mass moment of inertia
  - α = angular acceleration

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Units

- t = torque, N-m
- I_C = Mass Moment of Inertia, kg-m^2
- α = angular acceleration, rad/s^2

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English Units

- T= torque, lb-ft
- I_C = Mass Moment of Inertia about the center of mass, slug-ft^2 or ft-lb-sec^2
- α = angular acceleration, rad/s^2

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Mass Moment of Inertia

- Determined from Table 9-2
- Or use the following equations:

$$k = \sqrt{\frac{I}{m}} \qquad \text{or} \qquad I = k^2 m$$

Where k = radius of gyration

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Dynamic Equilibrium

- Inertial force is opposite acceleration
- Torque is used instead of force for calculating equilibrium
- Instead of $m \cdot a$, we have $I \cdot \alpha$

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Summation of Moments

- Establish direction of accel.
- Note torque and inertia
- Sum moments about center
- Sum of moments = zero

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Examples

- 13-7, 13-8, 13-9 & 13-10

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Week 9 Homework

- Chapter 13
  - Problems: 34, 38, 40, 41, 47 and 49
- Read Section 13-6

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