Dynamics of Rigid Bodies

Methods of Solutions

General Plane Motion

- Vector Method
  - Relative motion between two points
  - Common point on two rigid bodies
  - Resolving vector equation into x and y equations

- Geometric Method
  - Figure from triangular and other positions of linkages
  - Using Law of Sines and Cosines, etc.

- Instantaneous Center of Zero Velocity (IC)
  - Reducing general plane motion into simple rotation

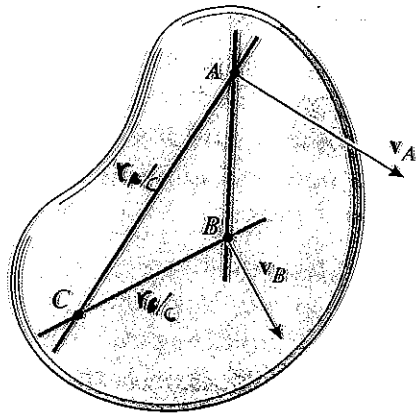
- Force, Moment and Acceleration Method
  - Newton's laws of motion in translation and rotation

- Work and Energy
  - Conservation of Energy

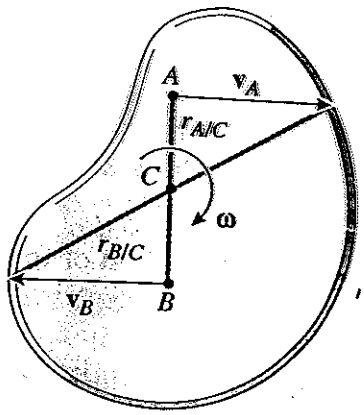
- Impulse and Momentum
  - Conservation of Linear Momentum
  - Conservation of Angular Momentum

Instantaneous Center of Zero Velocity (I.C.)

- At any instant in time, it is possible to find a point on a rigid body in general plane motion that has zero velocity.



- A and B are any two points on a rigid body whose velocities are known. The intersection of lines perpendicular to these velocities locate the I.C. of zero velocity.



- $\bar{v}_C = 0$

  $\bar{v}_A = \bar{v}_C + \bar{v}_{A/C} = \bar{v}_{A/C}$

  $= \omega \bar{k} \times \bar{r}_{A/C}$

- $\bar{v}_B = \bar{v}_C + \bar{v}_{B/C} = \bar{v}_{B/C}$

  $= \omega \bar{k} \times \bar{r}_{B/C}$

- For v_A and v_B parallel but opposite, the I.C. lies between the velocities

- For v_A and v_B parallel and in the same diection, the I.C. lies either above or below the velocities in accordance with their magnitudes