

Chapter 5. Summary: Kinetics of Rigid Bodies

5.A Newton - Euler

$$\sum \vec{F} = m\vec{a}_G$$

$$\sum \vec{M}_A = I_G \vec{\alpha} + \vec{r}_{G/A} \times m\vec{a}_A$$

- Vector Equations

FBD = KD

• To help write your N-E eqns.

- Forces, accelerations

5.B Work - Energy

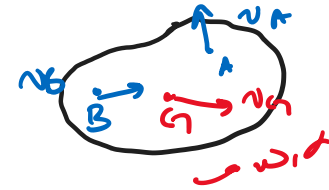
$$T_1 + V_1 + U_{1 \rightarrow 2}^{NC} = T_2 + V_2$$

• Look at summations for how to write each term depending on your selection of point.

• Forces, velocities/speeds, displacements

FBD $\rightarrow$ do we have NC forces doing work?

• scalar equation



5.C Impulse - Momentum

$$m\vec{v}_1 + \int_{t_1}^{t_2} \vec{F} dt = m\vec{v}_2$$

$$\underline{I} \vec{\omega}_1 + \int_{t_1}^{t_2} \vec{M}_A dt = I_A \vec{\omega}_2$$

Point of contact $\rightarrow e = \frac{(\vec{v}_{A,2,N})_{PC} - (\vec{v}_{B,2,N})_{PC}}{(\vec{v}_{B,1,N})_{PC} - (\vec{v}_{A,1,N})_{PC}}$

• Forces, velocities/speeds, time or impact

FBD $\rightarrow$ Do we have conservation of L/M or A/M in one direction or about a certain point

$$\sum \vec{F} = 0 \text{ or } \sum \vec{M}_A = 0$$

• vector equations