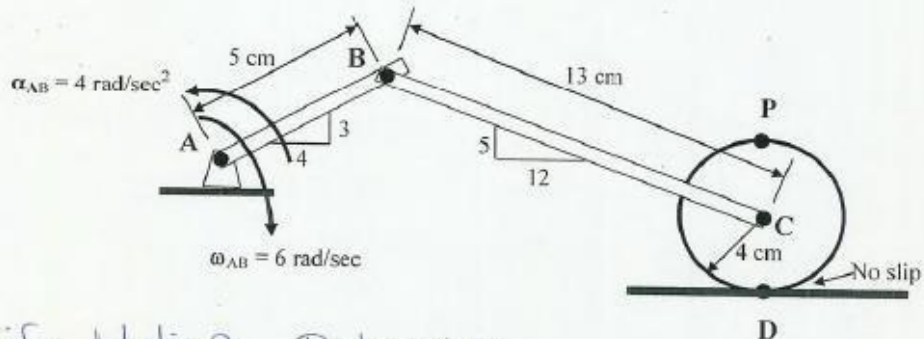


Rigid Body Kinematics IV – Problem 3

The angular velocity of link AB is 6 rad/sec clockwise and its angular acceleration is 4 rad/sec² counterclockwise. Wheel D rolls without slipping on the horizontal plane. Determine the angular acceleration of the wheel and the acceleration of point P on the wheel.



$\alpha_{AB} = 4 \text{ rad/sec}^2$
 $\omega_{AB} = 6 \text{ rad/sec}$

Classify Motion
 AB - RAFA
 BC - GPM
 wh - GPM

Determine
 α_{ph}, \vec{a}_p
 common pt "B"

Relative Velocity Eqs
 $\vec{V}_B = \vec{V}_A + \vec{V}_{B/A} = \vec{V}_C + \vec{V}_{B/C} \Rightarrow \vec{V}_{B/A} = \vec{V}_C + \vec{V}_{B/C}$

Kinematic Diagrams
 (Diagram showing velocity vectors and triangles for relative motion analysis)

Notes:
 $V_B = \omega_{AB} r_{AB} = 6(5) = 30$
 $V_C = \omega_{wh} r_{CD} = 4\omega_{wh}$
 (no slip wheel)
 $V_{B/C} = \omega_{BC} r_{BC} = \omega_{BC}(13)$

Scalar Eqs

$$\begin{aligned} + \rightarrow \frac{3}{5}(30) &= 4\omega_{wh} - \frac{5}{13}(13\omega_{BC}) \\ \uparrow - \frac{4}{5}(30) &= -\frac{12}{13}(13\omega_{BC}) \end{aligned}$$

$$\omega_{BC} = 2 \text{ rps} \uparrow$$

$$\omega_{wh} = 7 \text{ rps} \downarrow$$