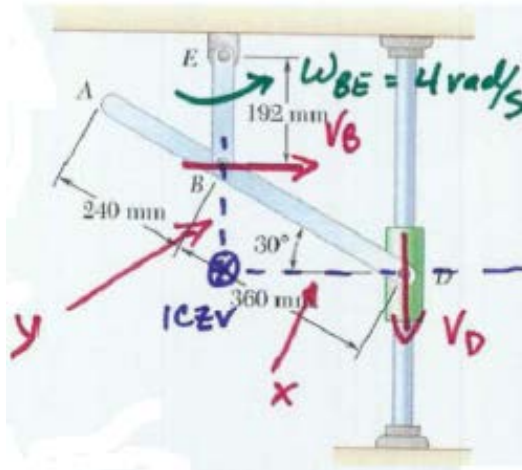


EGM 3420C - Engineering Mechanics Dynamics Review Problems

Problem 3. Rod **BE** has an angular velocity of 4 rad/s CCW. Determine the angular velocity of rod **BD** and the velocity of collar **D**.



CLASSIFY MOTION

BE	- RAFA
BD	- BPM
D	- TRANSLATION

ICZV SOLUTION

$$B \text{ TO ICZV} \Rightarrow \sin 30 = \frac{y}{.360} \quad y = 0.18 \text{ m}$$

$$D \text{ TO ICZV} \Rightarrow \cos 30 = \frac{x}{.36} \quad x = 0.312 \text{ m} = r_{D/IC}$$

$$V_B = \omega_{BE} r_B = 4(.192) = 0.768 \rightarrow \text{m/s}$$

$$V_B = \omega_{BD} r_{B/IC} \Rightarrow 0.768 = \omega_{BD} (0.18) \Rightarrow \omega_{BD} = 4.27 \downarrow \text{ rad/s}$$

$$V_D = \omega_{BD} r_{D/IC} = 4.27(.312) = 1.33 \text{ m/s} \downarrow$$

RELATIVE VELOCITY SOLUTION

$$V_B = V_E + V_{B/E} = V_D + V_{B/D}$$

$$\begin{array}{lcl} \rightarrow X & 0 + 0.768 & = 0 + 0.36 \sin 30 (\omega_{BD}) \\ \uparrow Y & 0 + 0 & = -V_D + 0.36 \cos 30 (\omega_{BD}) \end{array}$$

$\omega_{BD} = 4.27 \text{ rad/s} \downarrow$

$$V_D = 1.33 \text{ m/s} \downarrow$$

Answer: $\omega_{BD} = 4.27 \text{ rad/s CW}$ and $V_D = 1.33 \text{ m/s} \downarrow$