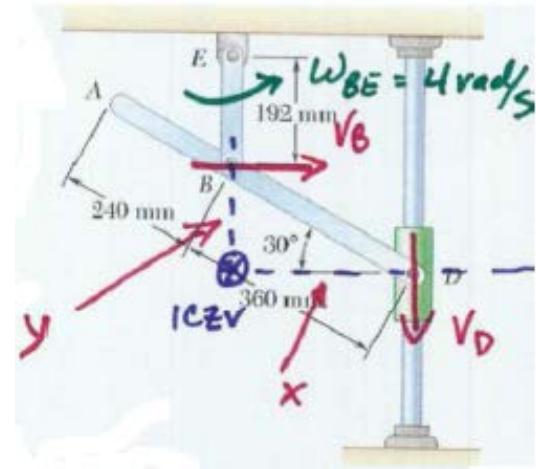


EGM 3420C - Engineering Mechanics Dynamics Review Problems

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

$$B \text{ TO } 1C2V \Rightarrow \sin 30 = \frac{y}{360} \quad y = 0.18 \text{ m}$$

$$D \text{ TO } 100\% \Rightarrow 4030 = \frac{x}{.36} \quad x = 0.312 \text{ m} = 1'0.12$$

$$V_B = \omega_{BE} r_B = 4(0.192) = 0.768 \rightarrow m/s$$

$$V_B = \omega_{BD} r_{Bf_1} \Rightarrow 0.76B = \omega_{BD}(0.48) \Rightarrow \underline{\omega_{BD} = 4.27 \text{ rad/s}}$$

$$V_D = \omega_{BD} r_{0r1c} = 4.27(312) = \underline{1.33 \text{ m/s}} \downarrow$$

RELATIVE VELOCITY SOLUTION

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

$$0.192 \text{ m} \quad \begin{array}{c} \text{at } 45^\circ \\ \text{from vertical} \end{array} = V_D + \omega_B \cdot 0.36 \text{ m}$$

$$\rightarrow x \quad 0 + 0.768 = 0 + 0.36 \sin 30 (\omega_0) \quad \cancel{\omega_0 = 4.27 \text{ rad/s}}$$

$$+y \quad 0 + 0 = -V_D + 0.36 \cos 30^\circ (w_{AB})$$

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

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