

**Question Q1**

Block D moves to the right with a speed of  $v_D$ .

**Part A** – Show the location of the instant center for link DE in the figure to the right. The figure is drawn to scale.

**Part B** – If  $\vec{\omega}_{DE}$  represents the angular velocity of link DE, then:

- a)  $\vec{\omega}_{DE} = \text{CCW}$
- b)  $\vec{\omega}_{DE} = 0$
- c)  $\vec{\omega}_{DE} = \text{CW}$

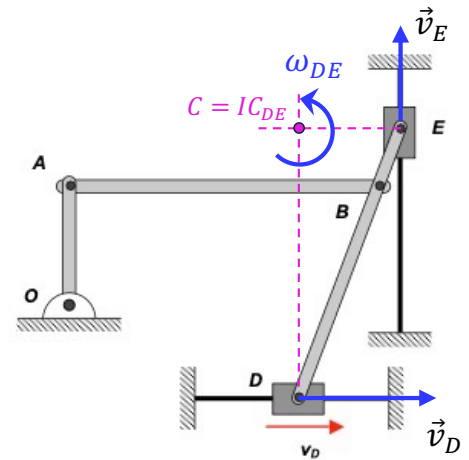
**Part C** – If  $v_E$  represents the speed of E in position shown, then:

- a)  $v_D > v_E$
- b)  $v_D = v_E$
- c)  $v_D < v_E$

$$v_D = |\vec{r}_{D/C}| \omega_{DE}$$

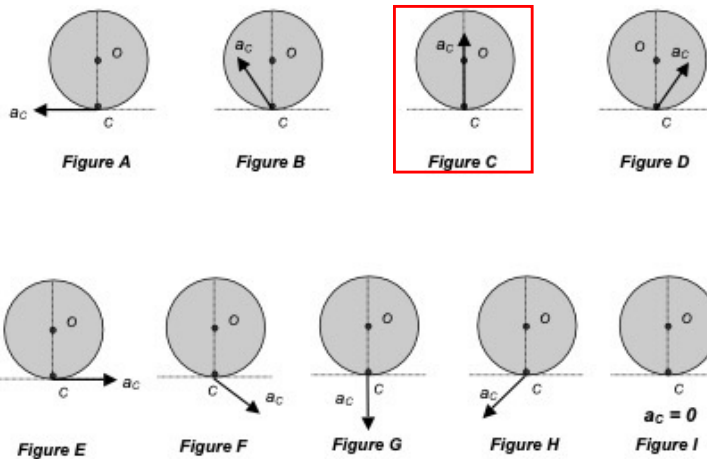
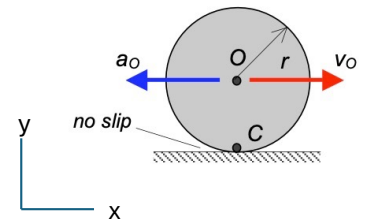
$$v_E = |\vec{r}_{E/C}| \omega_{DE}$$

$$|\vec{r}_{D/C}| > |\vec{r}_{E/C}| \Rightarrow v_D > v_E$$



**Question Q2**

A disk rolls to the right with its center O having a speed of  $v_O$  and  $\dot{v}_O < 0$ . Circle the figure below that most accurately represents the direction of the acceleration of the no-slip contact point C.



Since C is no-slip point on a fixed surface aligned with the x-axis, we know that  $a_{Cx} = 0$ . Also, O moves on a straight path aligned with the x-axis.

$$\vec{a}_C = \vec{a}_O + \vec{\alpha} \times \vec{r}_{C/O} - \omega^2 \vec{r}_{C/O}$$

$$a_{Cy} \hat{j} = -a_O \hat{i} + (\alpha \hat{k}) \times (-r \hat{j}) - \omega^2 (-r \hat{j})$$

$$= (-a_O + r\alpha) \hat{i} + r\omega^2 \hat{j}$$

Balancing the y-components shows that  $a_{Cy} = r\omega^2 > 0$ .