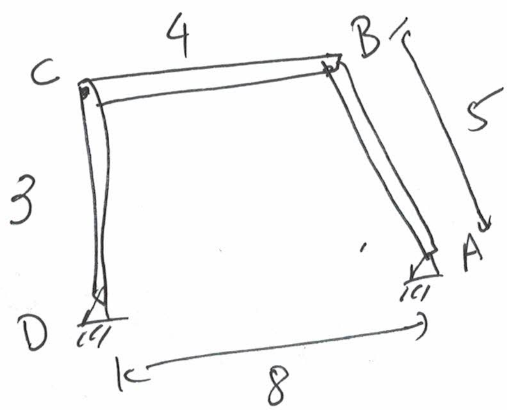
1)

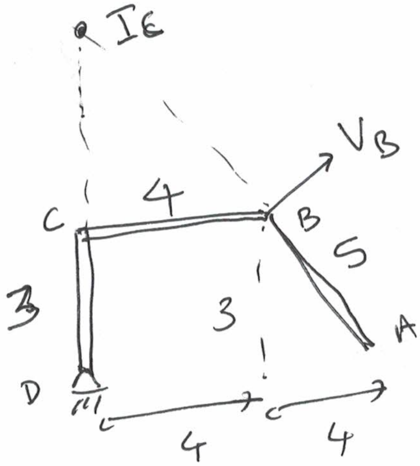


A B, C, D → pin joints, free to rotat[e]

given $\omega_{AB} = 1$ rad/s clockwis[e]

compute ω_{BC}, α_{BC}, $\vec{a}_c$, $\vec{V}_c$.

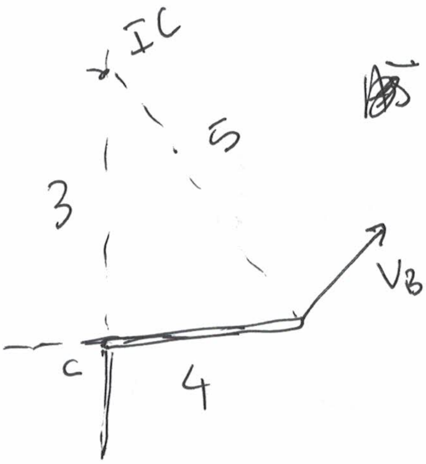
1) IC method for velocity.



$V_B^A = \omega_{AB} R_{B/A}$ (magnitude only)

$= 1 \times 5$

$V_B^A = 5$ m/s



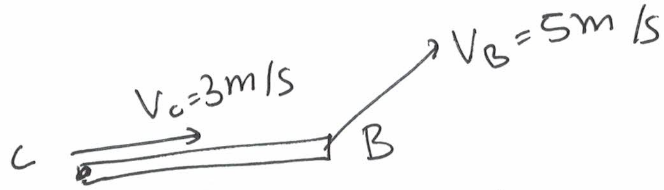
IC has '0' velocity,

→ Velocity of 'c' is perpendicular to DC. ~~Velocity of 'c' is ⊥~~

$$\omega_{BC} = \frac{V_B}{R_{B/IC}} = \frac{V_c}{R_{c/IC}}$$

$$\omega_{BC} = \frac{5}{5} = \frac{V_c}{3}$$

⇒ $\omega_{BC} = 1$ rad/s & $V_c = 3$ m/s



$\omega_{BC} = 1 rad/s$ ccw.

IC method cannot be applied directly to compute acceleration. for rigid body,

~~angular acceleration~~

tangential acceleration $= \alpha r$

~~C~~centrepetal acceleration $= -r\omega^2$

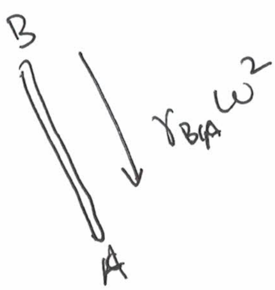
$$\vec{a}_B^{\,c} = \vec{a}_c + \vec{a}_{B/c}$$

$$= \vec{a}_c + \vec{\alpha}_{BC} \times \vec{r}_{B/c} + \vec{\omega}_{BC} \times (\vec{\omega}_{BC} \times \vec{r}_{B/c})$$

$$0 + \alpha_{BC} r_{B/c} \hat{u}_{\theta B/c} - \omega^2_{BC} r_{B/c} \hat{u}_{r_{B/c}}$$

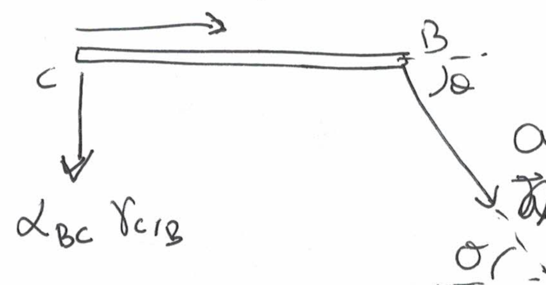
as $\alpha_{AB} = 0$,

$$\vec{a}_B^{\,c} = -\omega^2_{AB} r_{B/A} \hat{u}_{r_{B/c}}$$

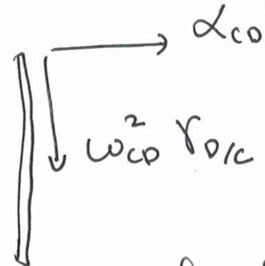


(Note $\omega^2_{BA} r_{B/A}$ is pointed in opposite direction)

a_c coming for ABC



a_c coming froom D to c



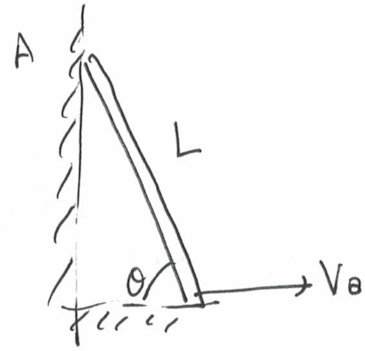
equating acceleration in $\hat{j}$ dirn,

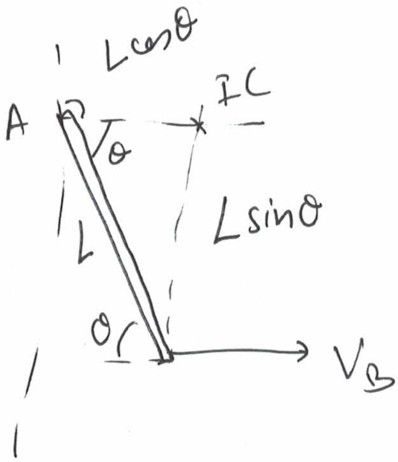
$$-\alpha_{BC} r_{C/B} - \omega_{AB}^2 r_{B/A} \sin\theta = -\omega_{CD}^2 r_{D/C}$$

$$-\alpha_{BC}(4) - 1^2 \times 5 \times \left(\frac{3}{5}\right) = -1^2 \times 3$$

$$\Rightarrow \boxed{\alpha_{BC} = 0}$$

given V_B at ~~an~~ angle 'θ' & $a_B = 0$, compute V_A & a_A.





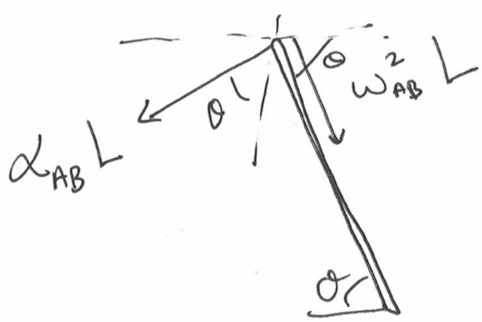
V_A lies along this line

$$\omega_{AB} = \frac{V_A}{L\cos\theta} = \frac{V_B}{L\sin\theta}$$

$$\Rightarrow \omega_{AB} = \frac{V_B}{L\sin\theta}$$

$$V_A = \frac{V_B}{\tan\theta}$$

Acceleration



as $a_x = 0$,

~~$\alpha_{AB} L \sin\theta + ($~~

$$\alpha_{AB} L \sin\theta - \omega_{AB}^2 L \cos\theta = 0$$

$$\Rightarrow \alpha_{AB} = \frac{\omega_{AB}^2 \cos\theta}{\sin\theta}$$

$$\Rightarrow \boxed{\alpha_{AB} = \frac{V_B^2 \cos\theta}{L^2 \sin^3\theta}}$$