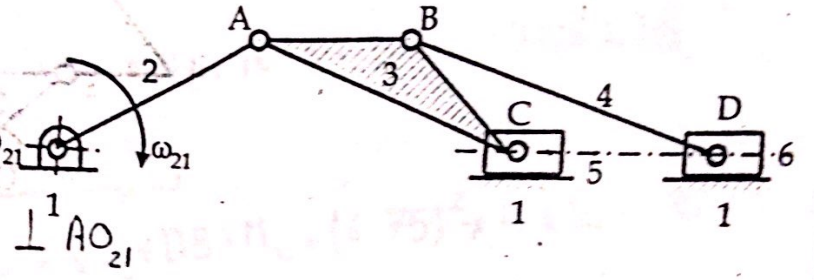
7) For the shown mechanism crank 2 rotates with a constant angular velocity $\omega_{21} = 25\ s^{-1}$.

a) Construct the velocity and acceleration diagrams, then

b) Determine the velocity and acceleration of both sliders link 5, and 6

C) Determine ω_{31}, ϵ_{31}, ω_{41}, and ϵ_{41}. given M_L 10cm/cm.



Velocity

$V_{O_{21}} = 0$ (fixed Point)

$V_{AO_{21}} = V_A - V_{O_{21}} = V_A = \omega_{21} * AO_{21} * M_L$

$V_{AO_{21}} = 25 * 2.8 * 10 = 700\ cm/s \perp AO_{21}$

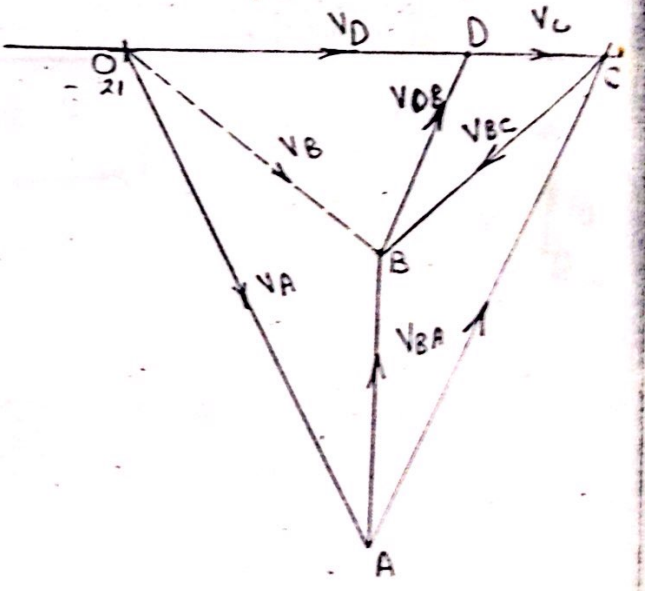
take $M_V = 100\ cm/s/cm$

$V_C = V_A + V_{CA}$

$V_C = V_{CO_{21}}$ // horizontal

$V_{CA} * M_V = \omega_3 * AC * M_L$

$7 * 100 = \omega_3 * 3.5 * 10 \Rightarrow \boxed{\omega_3 = 20\ s^{-1}}$



$V_B = V_A + V_{BA}$

$V_{BA} = \omega_3 * AB * M_L = 20 * 1.85 * 10 = 370\ cm/s \perp AB$

$V_B = V_C + V_{BC}$

$V_{BC} = 3.7 * 100 = 370\ cm/s \perp BC$

$V_D = V_B + V_{DB}$

$M_V * V_{DB} = \omega_{DB} * BD * M_L$

$100 * 2.7 = \omega_{DB} * 4 * 10 \Rightarrow \boxed{\omega_{DB} = 6.75\ s^{-1}}$

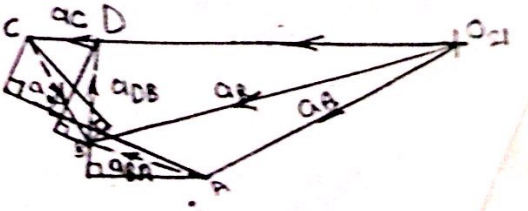
acceleration

$a_A = a_{AO_{21}} \Rightarrow a_{AO_{21}} = W_{21}^2 * AO_{21} * M_L = (25)^2 * 2.8 * 10$

$\boxed{a_{AO_{21}} = 17500\ cm/s^2}$ // $O_{21}A$

take $\boxed{M_a = 5000\ cm/s^2/cm}$

$a_C = a_A + a_{CA}$ $\begin{cases} a^n_{CA} = W_3^2 * AC * M_L = (20)^2 * (3.5) * 10 = 14000\ cm/s^2 \\ a^t_{CA} = \alpha_3 * AC * M_L \rightarrow (1) \end{cases}$



$a_C = a_{CO_{21}}$ // $O_{21}C$

$\boxed{a_C = 5.95 * 5000 = 29750\ cm/s^2}$

From (1) $\Rightarrow \boxed{\alpha_3 = \frac{0.7 * 5000}{\quad} = 100\ s^{-1}}$

$$\frac{a_{BA}}{a_{CA}} = \frac{BA}{CA} \rightarrow \frac{3.1*200}{a_{CA}} = \frac{2.1}{4.05} \Rightarrow \boxed{a_{CA} = 1195.7 \text{ cm/s}^2}$$

in a_{BA} direction

$$\boxed{a_C = 5.3*200 = 1060 \text{ cm/s}^2}$$

$$a_D = a_C + a_{DC} \begin{cases} a^r_{DC} = \omega_5^2 * DC = (9.15)^2 * 5.3 = 443.73 \text{ cm/s}^2 \\ a^t_{DC} = \alpha_5 * DC \rightarrow (2) \end{cases}$$

$a_{DO_{21}}$ Vertical $= a_D$

$$\boxed{a_D = 0.7*200 = 140 \text{ cm/s}^2}$$

from (2) $\alpha_5 = \frac{a^t_{DC} * Mq}{DC} = \frac{5*200}{5.2}$

$$\boxed{\alpha_5 = 192.3 \text{ s}^{-2}}$$

$$\boxed{a_3 = a_{CA} = 1195.7 \text{ cm/s}^2}$$

$$\boxed{a_5 = a_{DC} = 5.5*200 = 1100 \text{ cm/s}^2}$$

$$a_B = a_A + a_{BA}$$

$$a^n_{BA} = \omega_3^2 * AB * M_L = (20)^2 (1.85) * 10 = 7400 \text{ cm/s}^2$$

$$a^t_{BA} = \alpha_3 * AB * M_L = 100 * 1.85 * 10 = 1850 \text{ cm/s}^2$$

$$a_B = a_C + a_{BC}$$

$$a^n_{BC} = \omega_3^2 * BC * M_L = (20)^2 * (1.9) * 10 = 7600 \text{ cm/s}^2$$

$$a^t_{BC} = \alpha_3 * BC * M_L = 100 * 1.9 * 10 = 1900 \text{ cm/s}^2$$

$$a_B = 4.8 * 5000 = 24000 \text{ cm/s}^2$$

$$a_D = a_B + a_{DB}$$

$$a^n_{BB} = \omega_4^2 * DB * M_L = (6.75)^2 * 4 * 10 = 1822 \text{ cm/s}^2$$

$$a^t_{DB} = \alpha_4 * DB * M_L \rightarrow (2)$$

$$a_D = a_{DO_{41}} // O_{21}D$$

$$a_D = 4.6 * 5000 = 23000 \text{ cm/s}^2$$

From (2) $\Rightarrow$ $\alpha_4 = \dfrac{1.25 * 5000}{4 * 10} = 156.25 \text{ s}^{-2}$