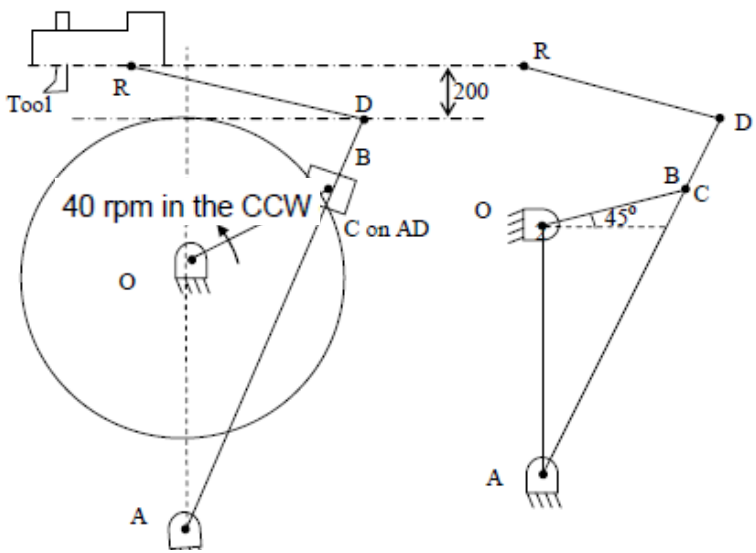
Dynamics of Machinery

Credits: 3

Lecturer: Abbasi

$O_1O_2$ = 800 mm, $O_1B$ = 300 mm, $O_2D$ = 1300 mm and DR = 400 mm

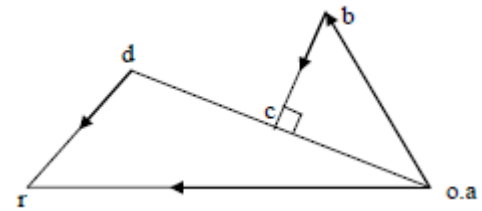


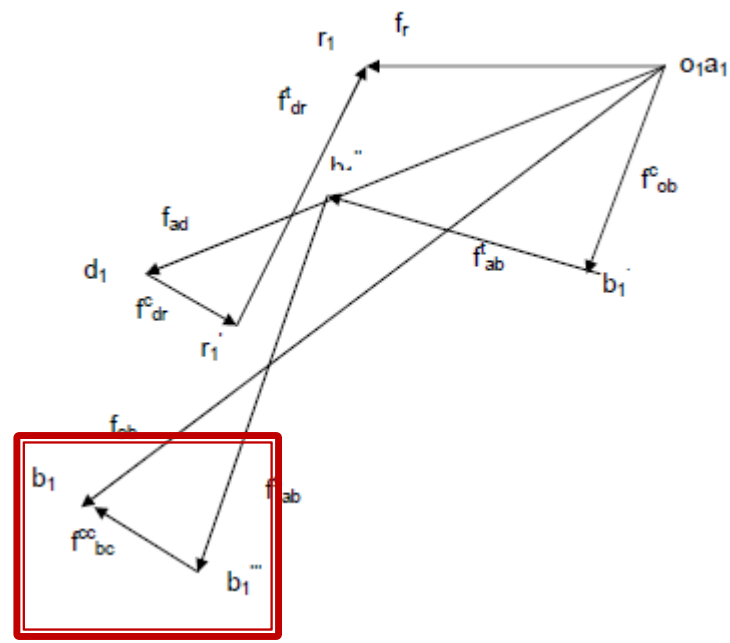

| Sl. No. | Link | Magnitude m/s$^2$ | Direction | Sense |
|---|---|---|---|---|
| 1. | OB | $f^c_{ob} = \omega^2 r = 5.24$ | Parallel to OB | → O<br>– |
| 2. | AC | $f^c_{ac} = \omega^2 r$<br>$f^t_{ac} = \alpha r$ | Parallel to AB<br>$\perp^r$ to AB | → A<br>– |
| 3. | BC | $f^s_{bc} = \alpha r$<br>$f^{cc}_{bc} = 2v\omega =$ | Parallel to AB<br>$\perp^r$ to AC | –<br>– |
| 4. | DR | $f^c_{bd} = \omega^2 r = 20$<br>$f^t_{bd} = \alpha\ r$ | Parallel to DR<br>$\perp^r$ to BD | → D<br>– |
| 5. | Slider R | $f^t_{bd} = \alpha r$ | Parallel to slider motion | – |

$V_b = \omega_{OB} \times OB$

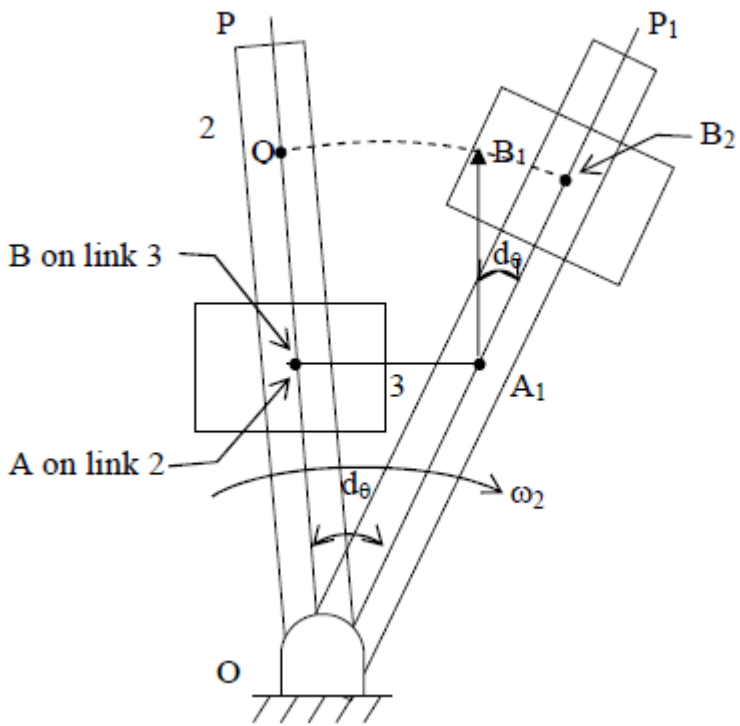
$$\omega_{OB} = \frac{2\pi N_{O1B}}{60} = \frac{2\pi \times 40}{60} = 4.18\,\text{rad/sec}$$

$V_b = 4.18 \times 0.3 = 1.254$ m/sec



## Coriolis Acceleration




We have Arc $B_1B_2$ = Arc $QB_2$ – Arc $QB_1$

= Arc $QB_2$ – Arc $AA_1$

$\therefore$ Arc $B_1B_2$ = OQ dθ - AO dθ

= $A_1B_1$ dθ

= $V_{B/A}\,\omega_2 dt^2$

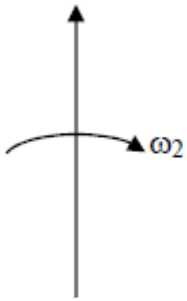
$\therefore$ Displacement $B_1B_2 = \frac{1}{2} at^2$

$= \frac{1}{2} f (dt)^2$

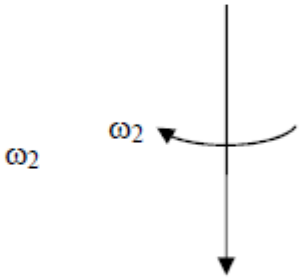
$\therefore \frac{1}{2} f (dt)^2 = V_{B/A}\,\omega_2\, dt^2$

$f^{cr}_{B/A} = 2\omega_2 V_{B/A}$ coriolis acceleration

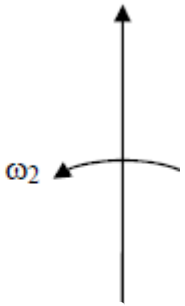
The direction of coriolis component is the direction of relative velocity vector for the two coincident points rotated at 90o in the direction of angular velocity of rotation of the link.



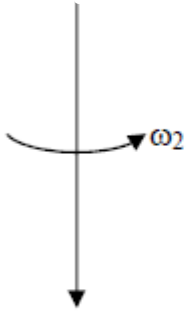

(a) Rotation CW slider moving up



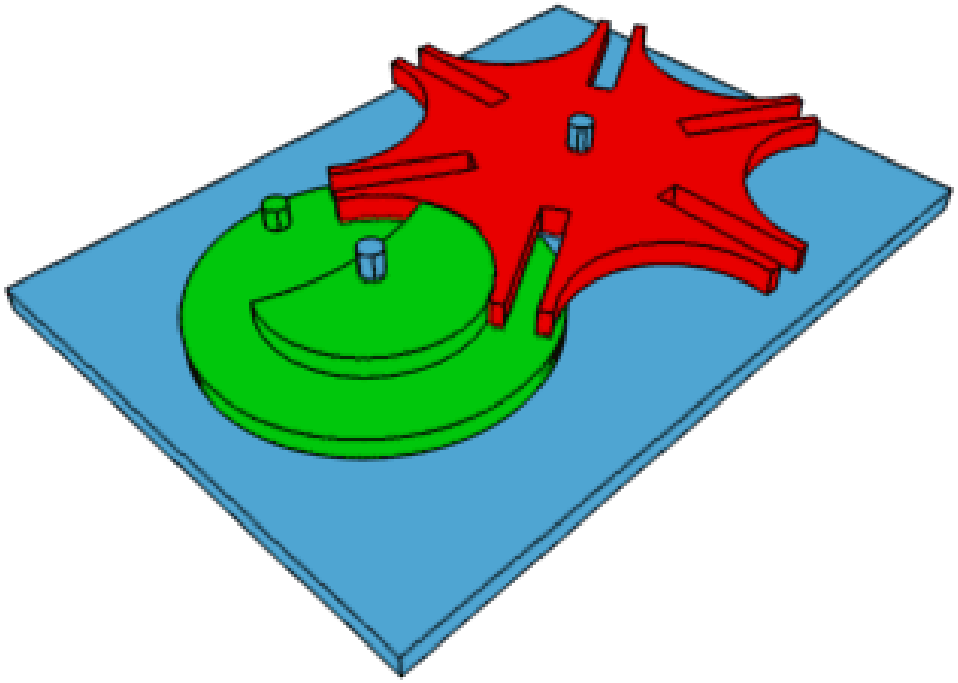

(b) Rotation CW slider moving down

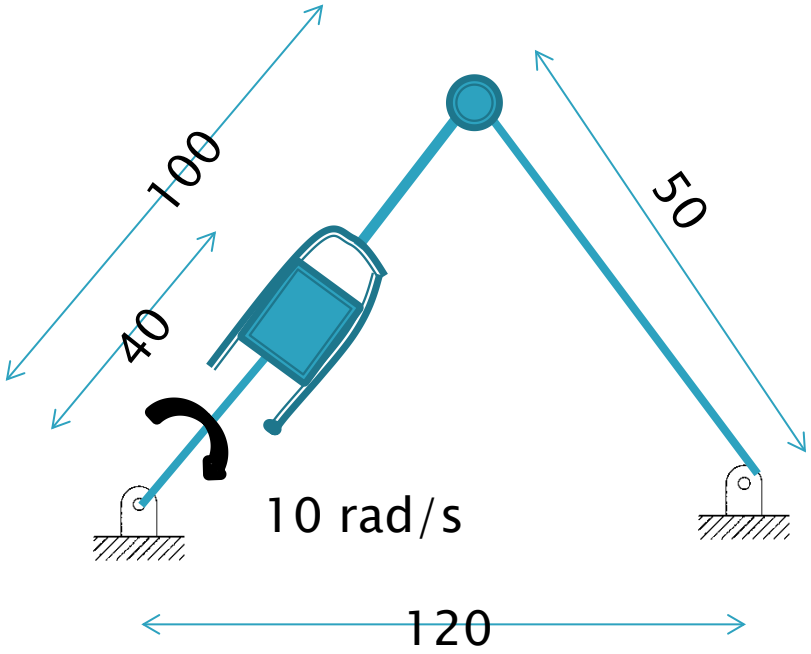


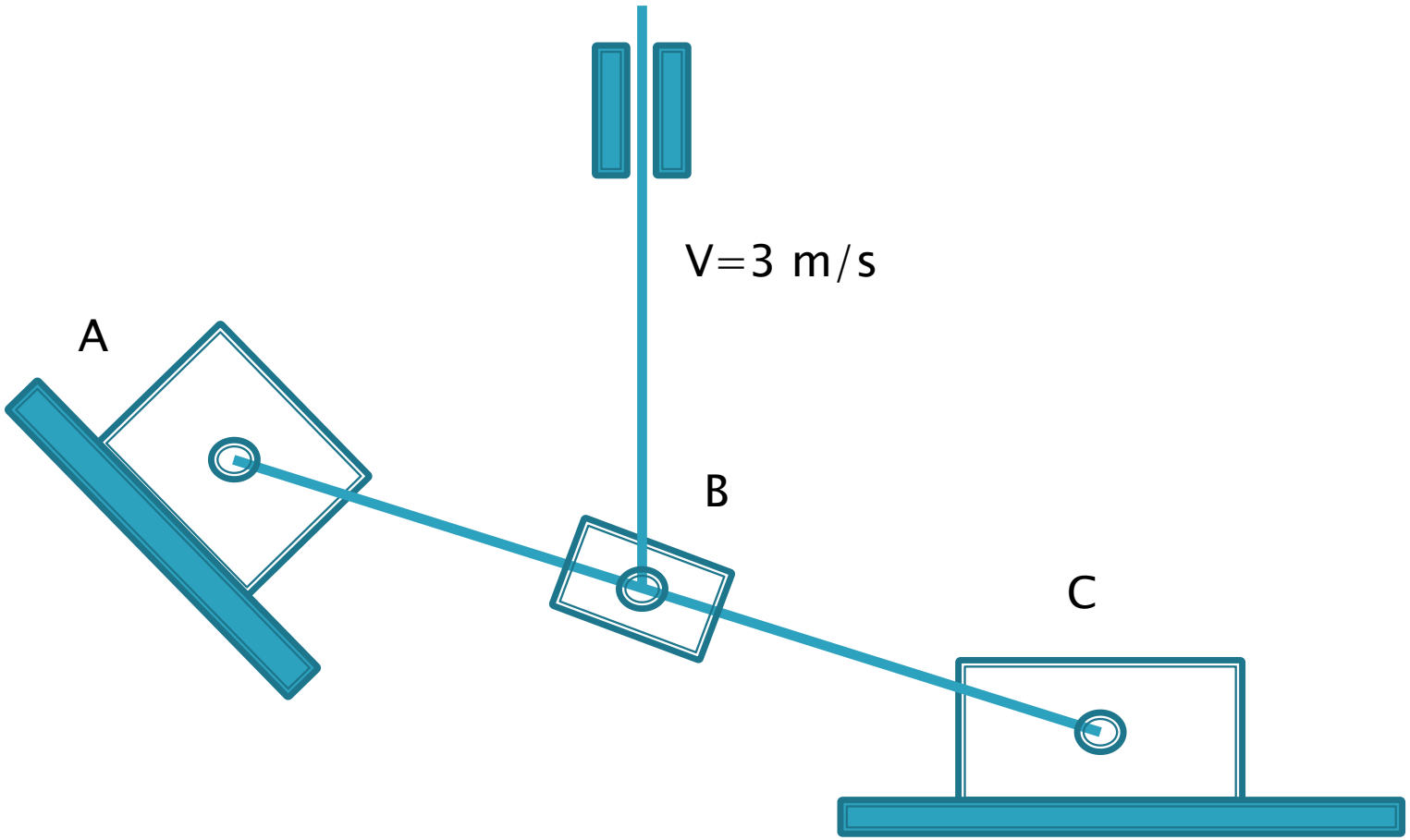

(c) Rotation CCW slider moving up




(d) Rotation CCW slider moving down




100
40
50
10 rad/s
120


V=3 m/s
A
B
C

***Thank you for your attention!***

***Questions, please!***