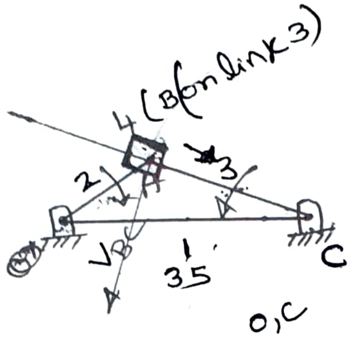
Numerical on Corrolis Component of Acceleration.

link 2 rotates at 20 rad/sec $= \omega_2$

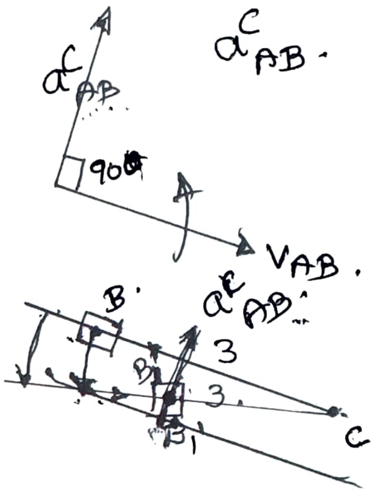


OC = 35 cm.

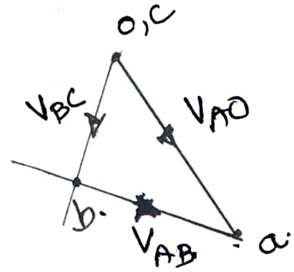
OA = 15 cm.

BC = 25 cm.

Draw velocity and acceleration diagram



Sol



velocity diagram.

By measurement.

$V_{AB} = 2.6$ m/s.

$V_{BC} = 1.8$ m/s

} measurement

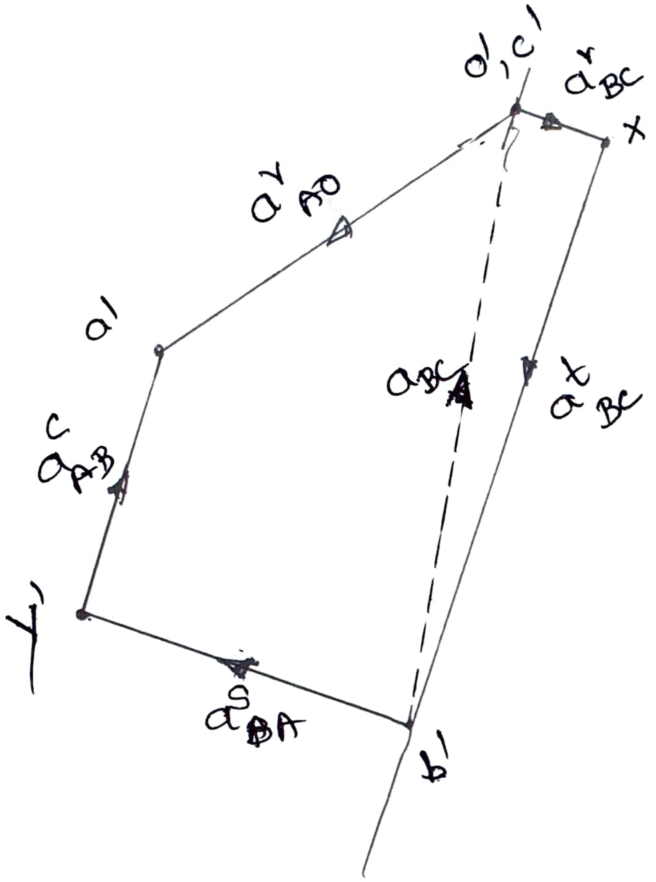
(OA) link 2 rotates clockwise $V_{AO} \perp OA$.

$V_{AO} = \omega_2 \times OA = 20$ rad/sec $\times$ 0.15 m.

$= 3$ m/s.

Acceleration Diagram

$$a^r_{AO} = \frac{V_{AO}^2}{AO} = \frac{3^2}{0.15} = 60 \text{ m/s}^2$$



$$a^c_{AB} = 2 V_{AB} \times \omega_3$$

$$= 2 \times 2.6 \times \omega_3$$

$$\omega_3 = \frac{V_{BC}}{BC} = \frac{(1.8)}{.25}$$

$$= 7.2$$

rad/sec.

$$a^c_{AB} = 2 \times 2.6 \times 7.2$$

$$= \underline{\underline{37.44 \text{ m/sec}^2}}$$

$$a^r_{BC} = \frac{V_{BC}^2}{BC} = \frac{1.8^2}{.25}$$

$$= 12.96 \text{ m/s}^2$$

Acceleration diagram

a^s_{AB} = sliding.

$\longrightarrow$

$a^s_{BA} = \longleftarrow$

with the slider. This is practically ...

Example 2.23 ***A quick return mechanism is shown in Fig.2.41(a). Link 2 rotates at 20 rad/sec. Draw the velocity and acceleration diagram.***) BC 228

☺ ***Solution :*** ***Given Data :*** The angular velocity of link 2

$$\omega_2 = 20 \text{ rad/sec} ;$$

$$OA = 15 \text{ cm} = 0.15 \text{ m} ;$$

$$v_{AO} = \omega_2 \cdot OA$$

$$= 20 \times 0.15 = 3 \text{ m/sec}$$

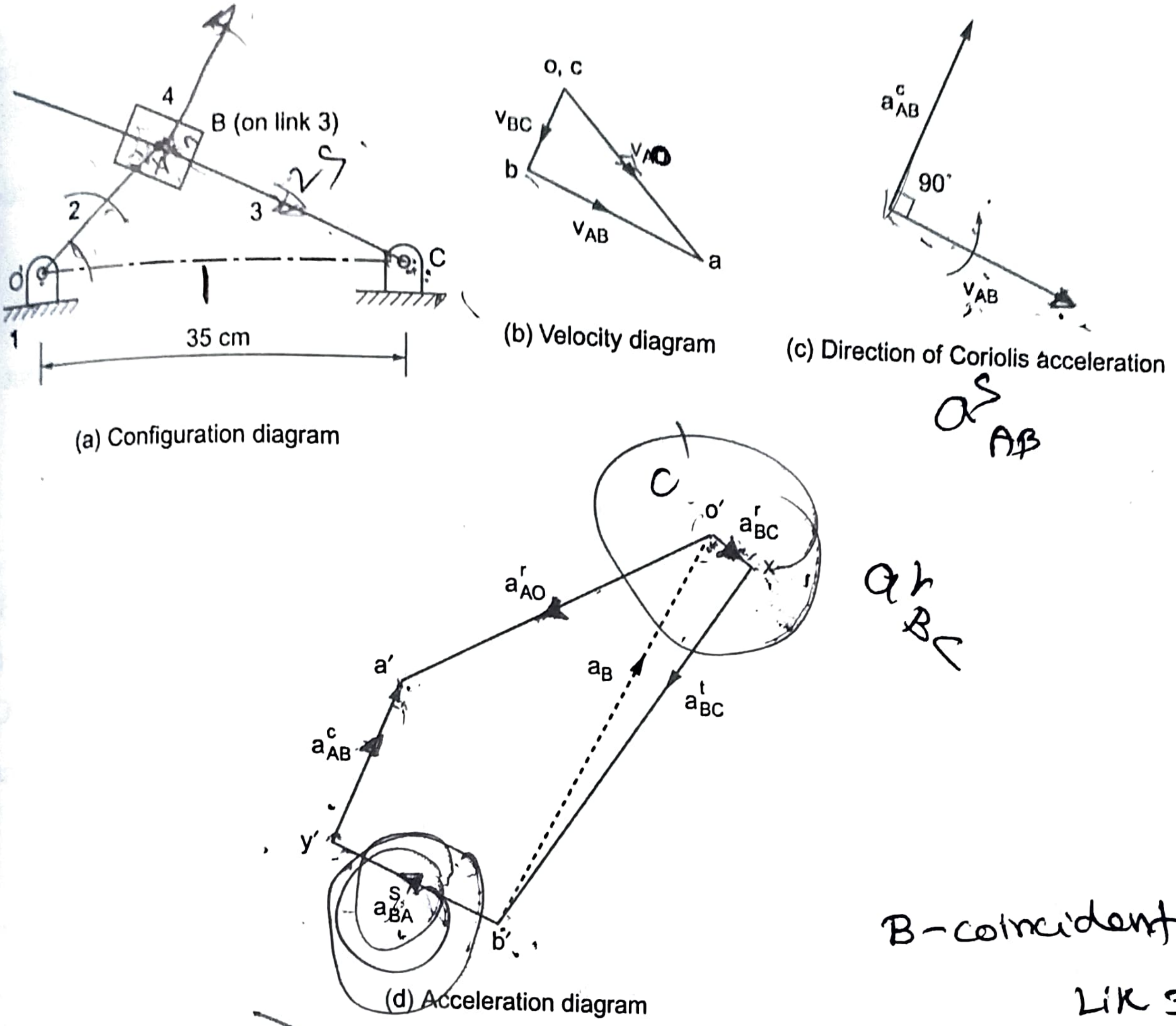


Fig. 2.41.

a^s_{AB}

B-coincident pt on Lik 3.

B & C   T, R, C with reference to Acy.

Procedure :

(a) *Configuration Diagram :* Refer Fig.2.41(a).

(b) *Velocity Diagram :* Refer Fig.2.41(b).

1. The velocity of point A with respect to O, v_{AO} is perpendicular to OA. Since O and C are fixed points on the configuration diagram, they may be taken as one point *o* or *c* on the velocity diagram. From *o* draw vector *oa* representing v_{AO}.
2. The velocity of point B on link 3 (CB with respect to C, v_{BC} is perpendicular to CB with unknown magnitude. From *c* draw vector *cb* representing v_{BC}. It contains point *b*.
3. The velocity of point B with respect to A, v_{BA} is along the path of the slider. From '*a*' draw a line *ab* parallel to the path of slider. It intersects *ob* at *o*. By measurement $ob = v_{BO} = v_B = 1.5$ m/sec.

(c) *Acceleration Diagram :* Refer Fig.2.41(d).

1. Draw $o'a' = a^r_{AO} = \dfrac{v^2_{AO}}{OA} = \dfrac{(3)^2}{0.15} = 60$ m/sec^2 parallel to AO with some scale.

2. From o' draw vector $o'x' = a^r_{BC} = \frac{v^2_{BC}}{BC} = \frac{(1.5)^2}{0.25} = 9$ m/sec^2 parallel to CB. From x draw $xb' = a^t_{BC}$, not known in magnitude and perpendicular to $o'x$.

3. Coriolis acceleration a^c_{AB} is introduced in the problem. Its magnitude nad direction both are to be determined.

$$\text{Magnitude } a^c_{AB} = 2 \cdot \omega_3 \cdot v_{AB}$$

$$\omega_3 = \frac{v_{BC}}{BC} = \frac{1.5}{0.25} = 6 \text{ rad/sec in anticlockwise direction about C.}$$

$$v_{AB} = 2.64 \text{ m/sec}$$

$$a^c_{AB} = 2 \times 6 \times 2.64 = 31.68 \text{ m/sec}^2$$

where ω_3 is the angular velocity of link 3.

Direction : a^c_{AB} is perpendicular to v_{AB}. It is shown in Fig.2.41(c). Rotation of link 3 is anticlockwise. Thus vector v_{AB} is rotated by 90° in anticlockwise direction to find the direction of a^r_{AB}. [∵ Link 3 rotates in anticlockwise sense about C).

4. The acceleration of sliding of B relative to A, a^s_{BA} is parallel to link 3. Its magnitude is unknown.

5. From a' draw vector $a'y' = 31.68$ m/sec^2 $= a^{cr}_{AB}$.

6. From y' draw vector $y'b'$ representing a^s_{BA} parallel to link 3. It intersects xb' at point b'.

7. Join o' to b'. Vector $o'b'$ represents the acceleration of B with respect to O. Thus $a_B = o'b'$.