SNS COLLEGE OF TECHNOLOGY

(An Autonomous Institution**)**

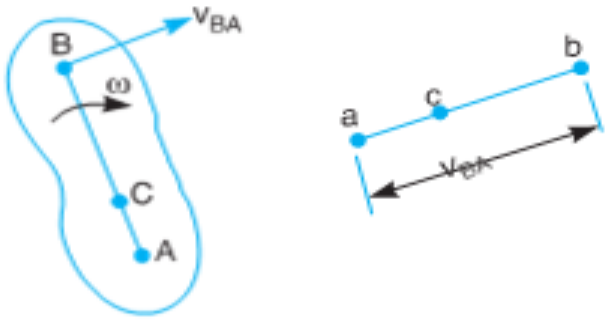
COIMBATORE–35

DEPARTMENT OF AUTOMOBILE ENGINEERING

19AUT203 - MECHANICS OF AUTOMOBLE SYSTEMS

VELOCITY IN MECHANISMS
(Relative Velocity Method)

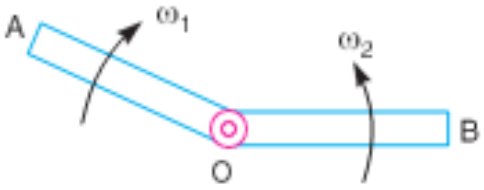
Motion of a Link:



Velocity of any point on a link with respect to another point on the same link is always perpendicularto the line joining these points on the configuration (or space) diagram.

Rubbing Velocity at a Pin Joint

The links in a mechanism are mostly connected by means of pin joints. The rubbing velocity is defined as the algebraic sum between the angular velocities of the two links which are connected by pin joints, multiplied by the radius of the pin.



Links connected by pin joints

Consider two links OA and OB connected by a pin joint at O as shown in Fig.

Let ω_1 = Angular velocity of the link OA orthe angular velocity of the point A with respect to O.

ω_2 = Angular velocity of the link OB or the angular velocity of the point Bwith respect to O, and

r = Radius of the pin.

According to the definition, Rubbing velocity at the pin joint O
= $(\omega_1 - \omega_2)\, r$, if the links move in the same direction
= $(\omega_1 + \omega_2)\, r$, if the links move in the opposite direction

Note : When the pin connects one sliding member and the other turning member, the angular velocity of thesliding member is zero. In such cases,

Rubbing velocity at the pin joint $= \omega.r$

where ω = Angular velocity of the turning member, and

r = Radius of the pin.

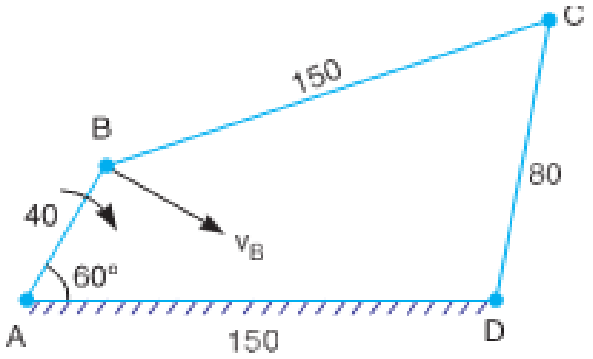
Problem

InafourbarchainABCD,ADisfixedandis150mmlong.ThecrankABis40 mmlongandrotatesat120r.p.m.clockwise,whilethelinkCD=80mmoscillatesaboutD. BCand AD are of equal length. Find the angular velocity of link CD when angle BAD =60°.

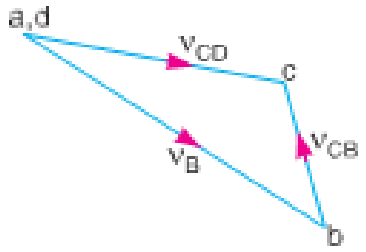
Given :

N_{BA} = 120 r.p.m. or
$\omega_{BA} = 2\pi \times 120/60 = 12.568$ rad/s
SincethelengthofcrankAB=40mm=0.04m,

$$V_{BA} = v_B = \omega_{BA} \times AB = 12.568 \times 0.04 = 0.503 \text{ m/s}$$



Space diagram



Velocitydiagram