SNS COLLEGE OF TECHNOLOGY

(AN AUTONOMOUS INSTITUTION)

Department of Mechanical Engineering

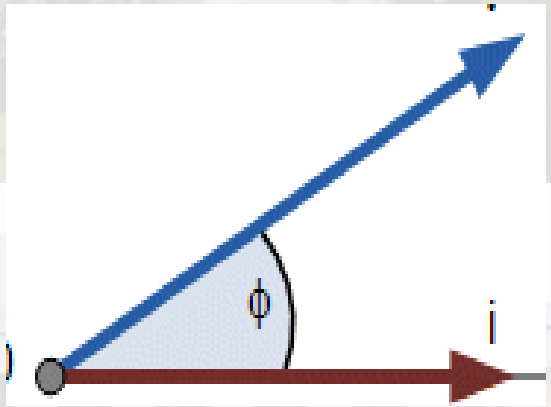
Kinematics of Machinery

UNIT – II

KINEMATICS OF LINKAGE MECHANISMS

TOPIC-2

CONSTRUCTION OF VELOCITY(CV)



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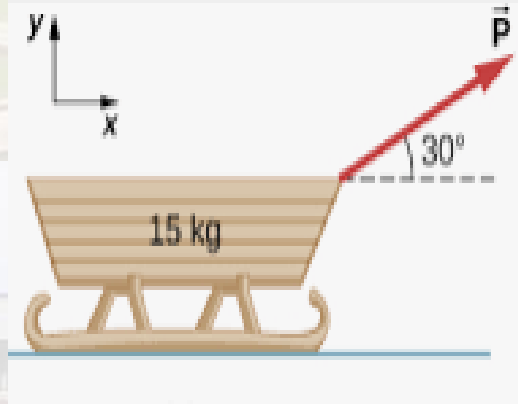

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CONSTRUCTION OF VELOCITY METHOD

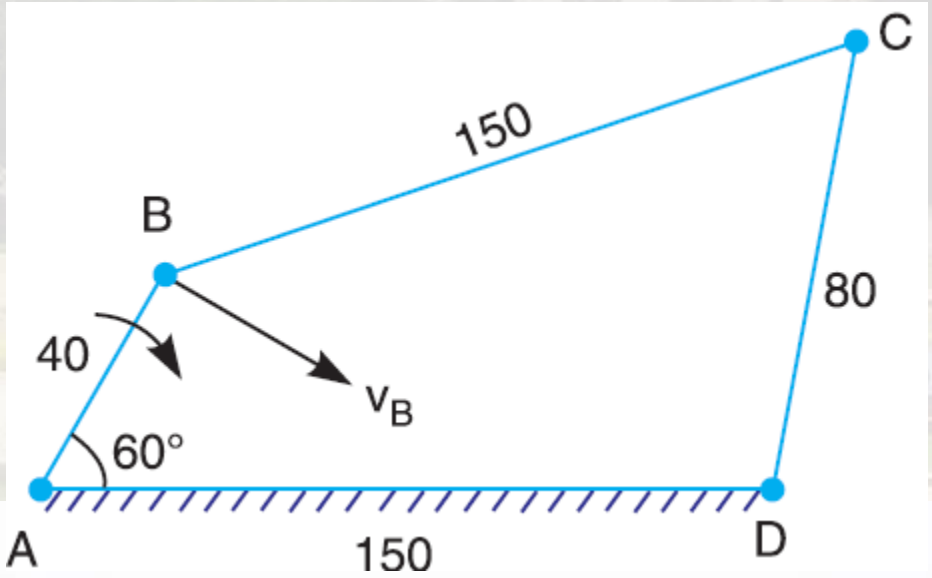
In a four bar chain ABCD, AD is fixed and is 150 mm long. The crank AB is 40 mm long and rotates at 120 r.p.m. clockwise, while the link CD = 80 mm oscillates about D. BC and AD are of equal length. Find the angular velocity of link CD when angle BAD = 60°.

Given : N_{BA} = 120 r.p.m. or

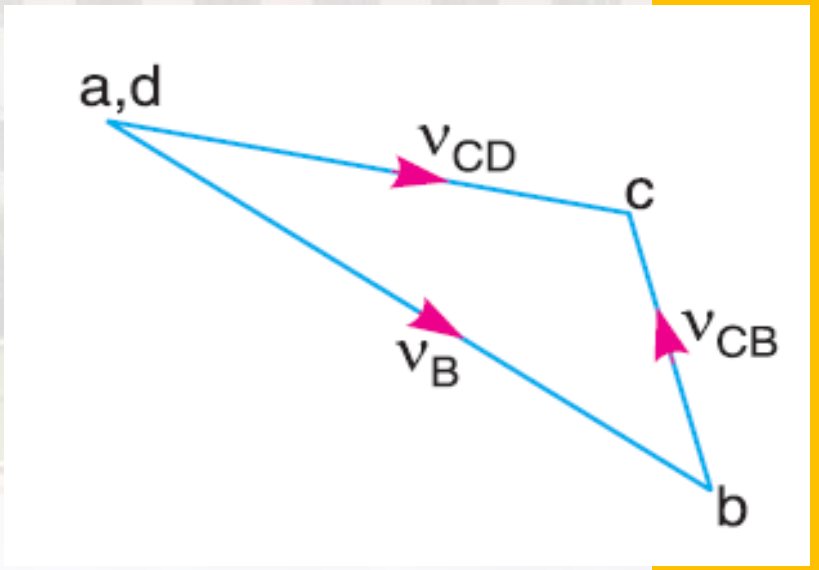
$\omega_{BA} = 2\,\Pi \times 120/60 = 12.568$ rad/s

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

CONSTRUCTION OF VELOCITY METHOD



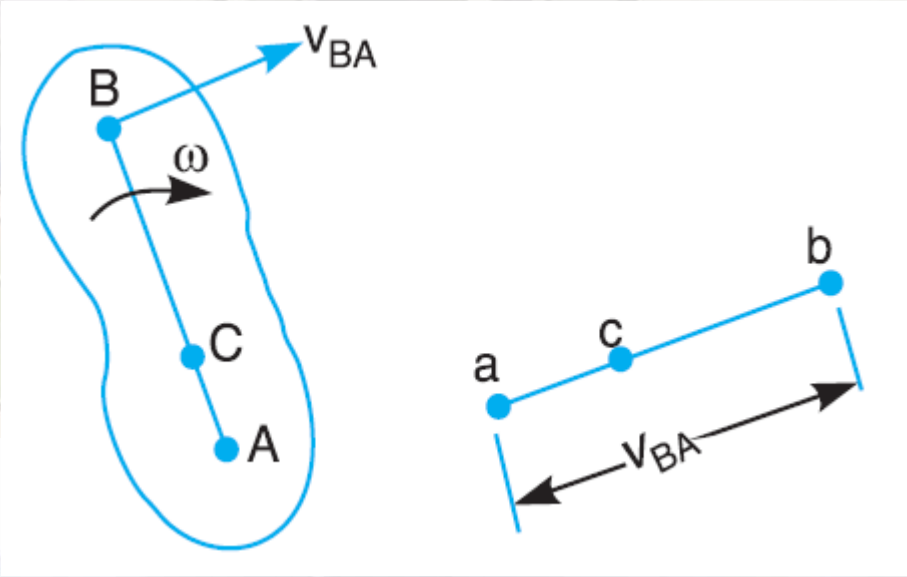
SOURCES: KHURMI R S



SPACE DIAGRAM **VELOCITY DIAGRAM**

MOTION OF A LINK

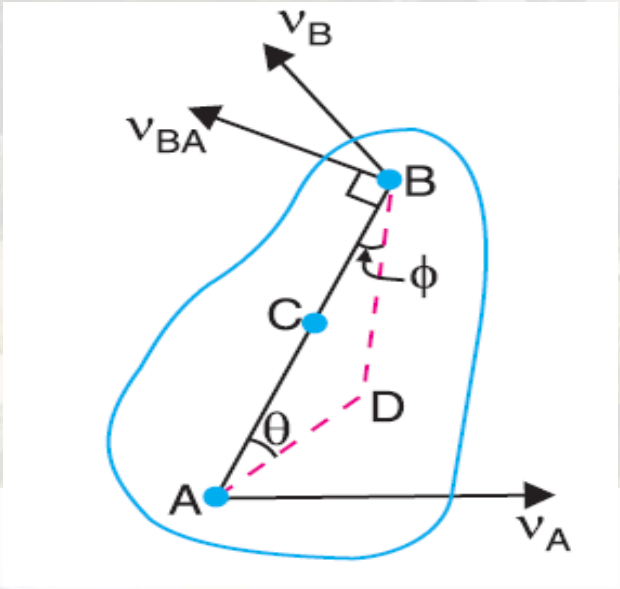
velocity of any point on a link with respect to another point on the same link is always perpendicular to the line joining these points on the configuration (or space) diagram.



SOURCE: KHURMI R S

MOTION OF A LINK

VELOCITY OF A POINT ON A LINK BY RELATIVE VELOCITY METHOD



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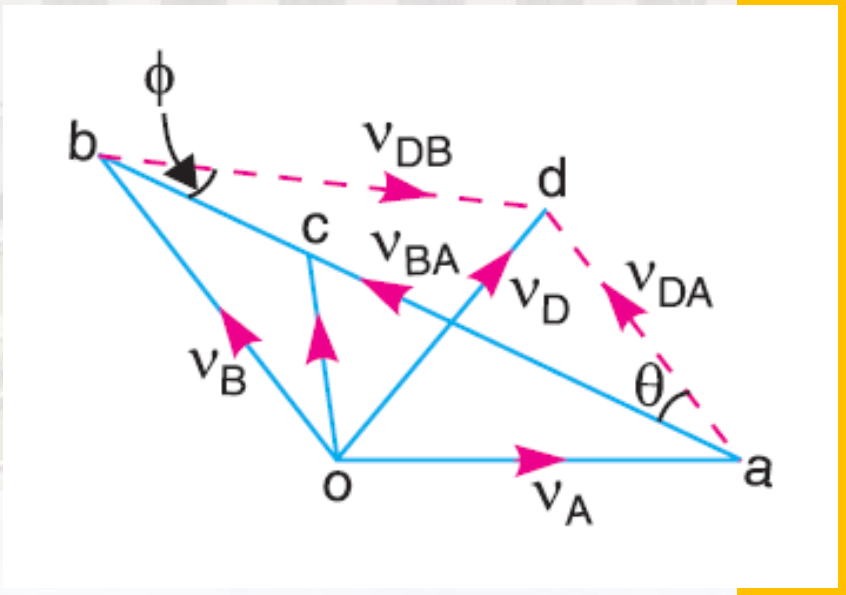
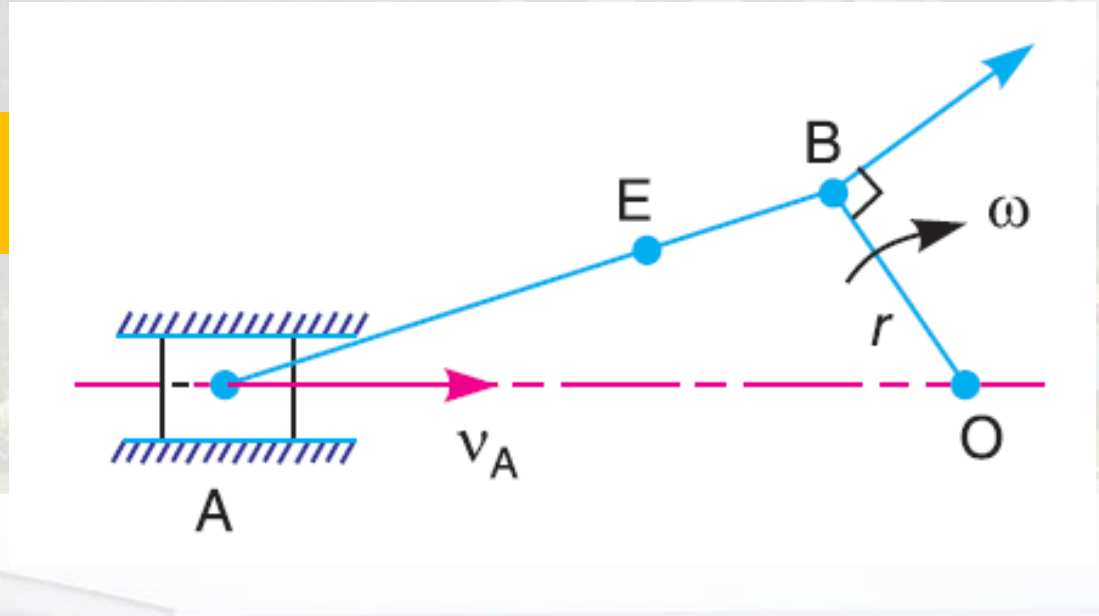
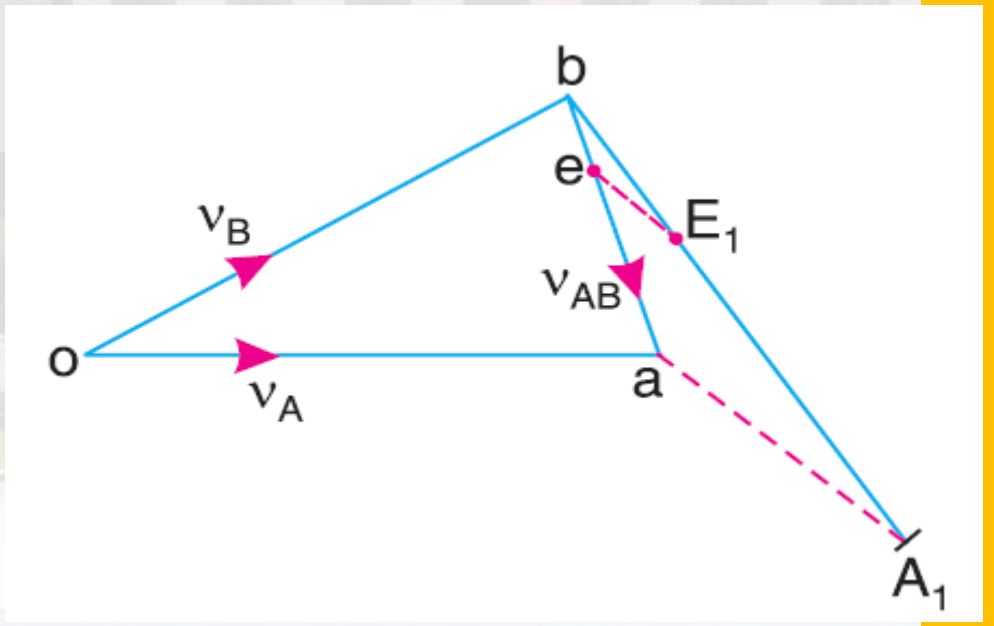


MOTION OF POINTS ON A LINK

VELOCITY DIAGRAM

VELOCITIES IN SLIDER CRANK MECHANISM

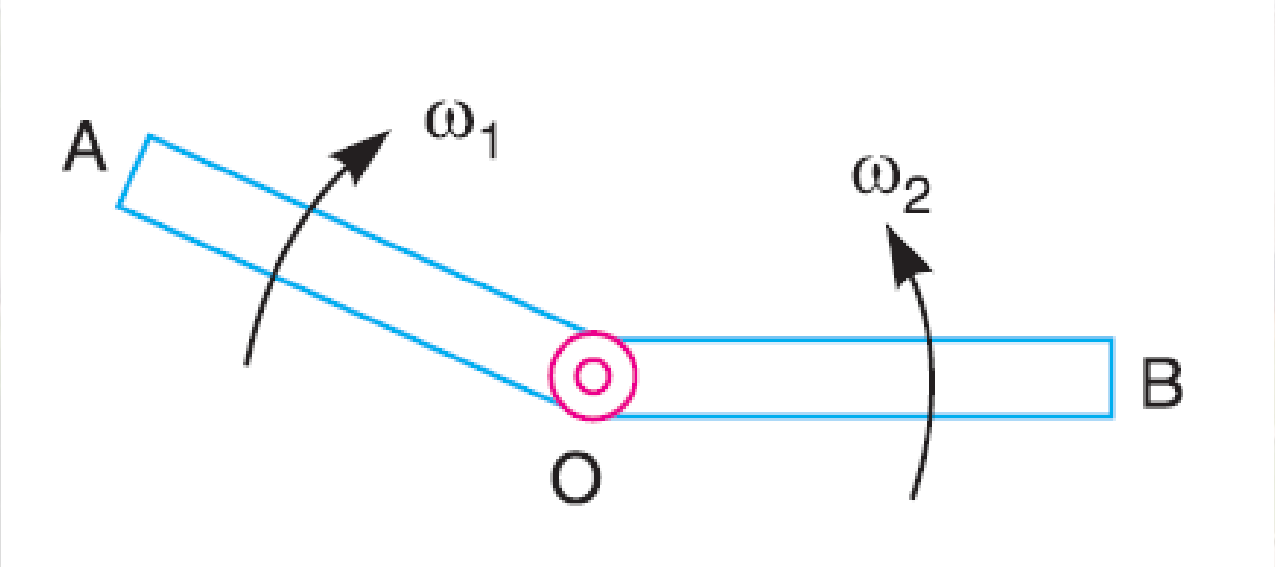




SOURCE: KHURMI R S

SLIDER CRANK MECHANISM

RUBBING VELOCITY AT A PIN JOINT



SOURCE: Khurmi R S

FIGURE: 1 PIN JOINTS

BOARD USAGE ALSO

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.

Rubbing velocity at the pin joint O
= (ω1 – ω2) r, if the links move in the same direction
= (ω1 + ω2) r, if the links move in the opposite direction

BOARD USAGE ALSO

RUBBING VELOCITY AT A PIN JOINT

Consider two links OA and OB connected by a pin joint at O as shown in Figure 1 in Slide Number-7.

Let ω1 = Angular velocity of the link OA or the angular velocity of the point A with respect to O.

ω2 = Angular velocity of the link OB or the angular velocity of the point B with respect to O, and

r = Radius of the pin.

BOARD USAGE ALSO

RUBBING VELOCITY AT A PIN JOINT

According to the definition,
Rubbing velocity at the pin joint O
= (ω1 – ω2) r, if the links move in the same direction
= (ω1 + ω2) r, if the links move in the opposite direction

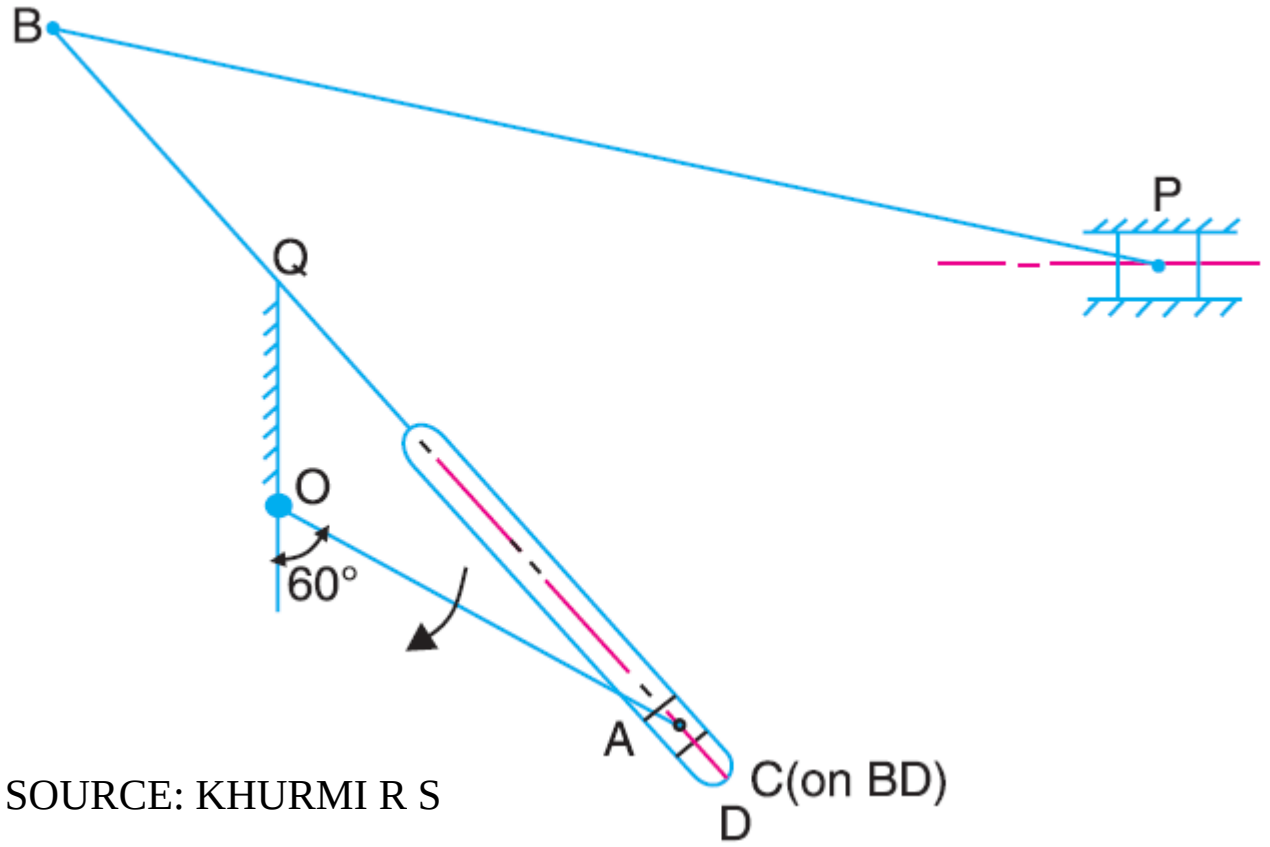
Rubbing velocity at the pin joint = ω.r
where ω = Angular velocity of the turning member, and
r = Radius of the pin.

BOARD USAGE ALSO

ASSESMENT QUESTIONS

1. In a Whitworth quick return motion mechanism, as shown in Figure 1 in slide number 12 , the dimensions of various links are as follows :
OQ = 100 mm ; OA = 200 mm ; BQ = 150 mm and BP = 500 mm.
If the crank OA turns at 120 r.p.m. in clockwise direction and makes an angle of 120° with OQ,
Find : 1. velocity of the block P, and 2. angular velocity of the slotted link BQ.

ASSESMENT QUESTIONS



SOURCE: KHURMI R S

FIGURE: 1

SEOURC: FREEPIK