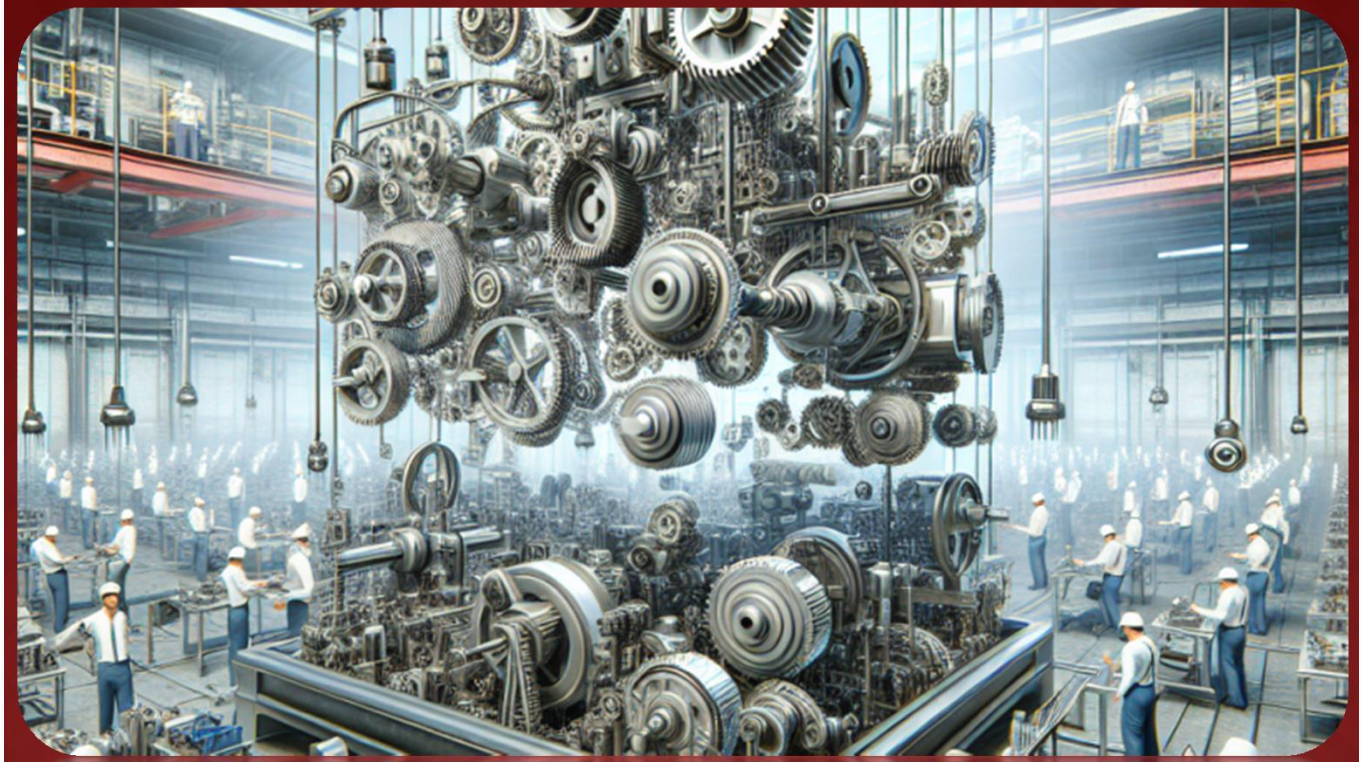
23MET204

MECHANICS OF MACHINES



VELOCITY AND ACCELERATION DIAGRAM BY GRAPHICAL METHOD (RELATIVE VELOCITY METHOD)

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AP/MECH

RECAP !!!

OVERVIEW OF VELOCITY DIAGRAM

Kinematics Analysis - The determination of motion characteristics such as displacement, velocity and acceleration of various links for a given input motion is known as kinematic analysis.

Configuration Diagram – It is a skeleton or a line diagram which represents the given mechanism.

Calculation of velocity of input link

$$V_{input\ link} = \omega_{input\ link} \times (\text{Length of input link})$$

PROBLEM

In a four bar chain ABCD, AD is fixed and is 120mm long. The crank AB is 30mm long and rotates at 100 rpm clockwise. While the link CD=60mm oscillates about D, BC and AD are of equal length. Find the angular velocity of link CD when angle BAD=60°

Given Data :

AD = 120mm (fixed); AB = 30mm; N_{BA} = 100rpm(CW);

CD = 60mm; BC = AD = 120mm; <BAD = 60°

To Find :

Angular Velocity of link CD = ?

PROBLEM

Solution :

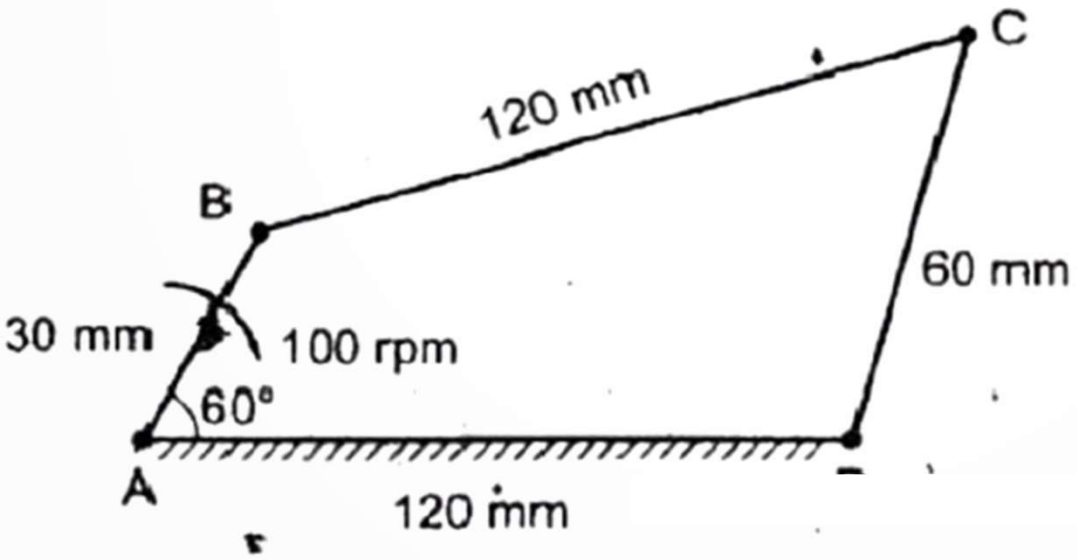
Relative Velocity Method

Configuration Diagram :

with suitable scale draw the configuration diagram

Scale

1 cm = 20 mm



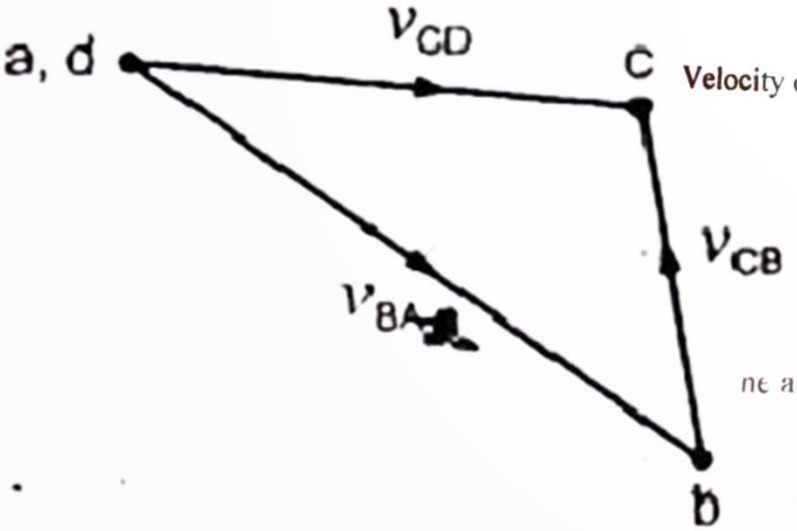
PROBLEM

Velocity Diagram :

The 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 diagram.

Speed of input link, N_{BA} = 100 rpm (given)

$$\omega_{BA} = \frac{2\pi N_{BA}}{60} = \frac{2\pi \times 100}{60} = 10.47 \text{ rad/s}$$



Velocity of the input link AB is given by

$$v_{BA} = \omega_{BA} \times AB = 10.47 \times 0.03 = 0.3141 \text{ m/s}$$

By measurement from the velocity diagram, we get

Velocity of link CD, v_{CD} = 0.2387 m/s

ne angular velocity of link CD is given by

$$\omega_{CD} = \frac{v_{CD}}{CD} = \frac{0.2387}{0.06}$$

= 4 rad/s (clockwise about D)

ASSESSMENT !!!