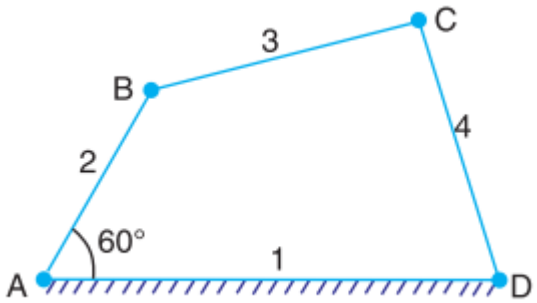
Lukhdhirji Engineering College, Morbi
Department of Mechanical Engineering

Subject: Kinematics & Theory of Machines (BE04000171) **Semester : 4th**
Year : 2025-26

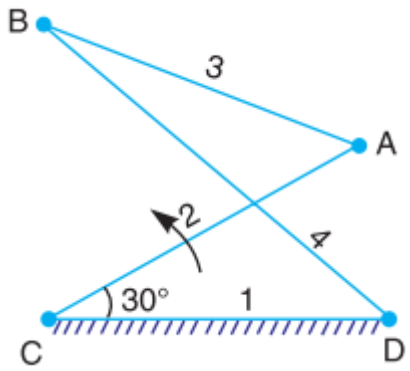
Assignment 2: Velocity & Acceleration Analysis of Mechanisms (CO2)

1. What do you understand by the instantaneous centre of rotation (centro) in kinematic of machines? Answer briefly.
2. Explain, with the help of a neat sketch, the space centrode and body centrode.
3. Explain with sketch the instantaneous centre method for determination of velocities of links and mechanisms.
4. Write the relation between the number of instantaneous centres and the number of links in a mechanism
5. Discuss the three types of instantaneous centres for a mechanism.
6. State and prove the 'Aronhold Kennedy's Theorem' of three instantaneous centres
7. Explain how the acceleration of a point on a link (whose direction is known) is obtained when the acceleration of some other point on the same link is given in magnitude and direction
8. Explain how the coriolis component of acceleration arises when a point is rotating about some other fixed point and at the same time its distance from the fixed point varies
9. Locate all the instantaneous centres for a four bar mechanism as shown in Figure. The lengths of various links are : AD = 125 mm ; A B = 62.5 mm ; BC = CD = 75 mm. If the link A B rotates at a uniform speed of 10 r.p.m. in the clockwise direction, find the angular velocity of the links BC and CD.

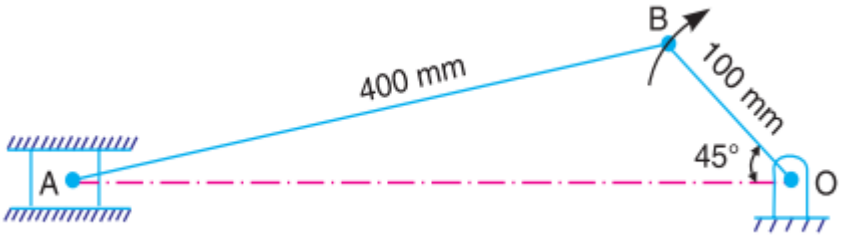


10. Locate all the instantaneous centres for the crossed four bar mechanism as shown

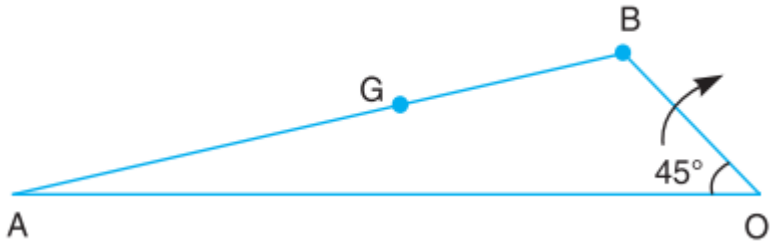
in Fig. 6.28. The dimensions of various links are : CD = 65 mm; C A = 60 mm ; DB = 80 mm ; and A B = 55 mm. Find the angular velocities of the links A B and DB, if the crank CA rotates at 100 r.p.m. in the anticlockwise direction



11. Locate all the instantaneous centres of the slider crank mechanism as shown in Figure. The lengths of crank OB and connecting rod AB are 100 mm and 400 mm respectively. If the crank rotates clockwise with an angular velocity of 10 rad/s, find: 1. Velocity of the slider A, and 2. Angular velocity of the connecting rod AB.



12. The engine mechanism shown in Figure has crank OB = 50 mm and length of connecting rod A B = 225 mm. The centre of gravity of the rod is at G which is 75 mm from B. The engine speed is 200 r.p.m. For the position shown, in which OB is turned 45° from O A, Find 1. the velocity of G and the angular velocity of A B, and 2. the acceleration of G and angular acceleration of A B.



13. In a pin jointed four bar mechanism ABCD, the lengths of various links are as follows: A B = 25 mm ; BC = 87.5 mm ; CD = 50 mm and AD = 80 mm. The link AD is fixed and the angle BAD = 135°. If the velocity of B is 1.8 m/s in the clockwise direction, find 1. velocity and acceleration of the mid point of BC, and 2. angular velocity and angular acceleration of link CB and CD
14. In a quick return mechanism, as shown in Figure, the driving crank OA is 60 mm long and rotates at a uniform speed of 200 r.p.m. in a clockwise direction. For the position shown, find 1. velocity of the ram R ; 2. acceleration of the ram R, and 3. acceleration of the sliding block A along the slotted bar CD.