CONCORDIA UNIVERSITY
Faculty of Engineering and Computer Science
Department of Mechanical and Industrial Engineering

MECH 343/2 X: Theory of Machines 1, Winter 2011-12
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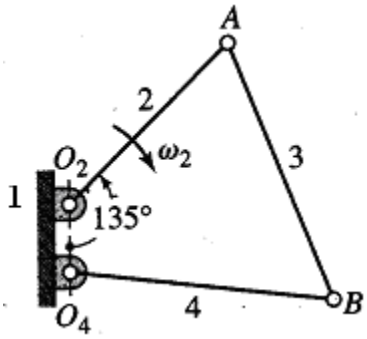
Assignment 6:

Question 1:

Crank O_2A of a drag-link mechanism rotates at a constant angular velocity of 50 rad/s in the clockwise sense. Here, O_2O_4 = 100 mm, O_2A = 350 mm, AB = 425 mm and O_4B = 400 mm. For the configuration shown, crank O_2A makes 135˚ with the line of centers O_2O_4. From the velocity analysis, the angular velocities of links 2 and 3 are found to be 36.80 rad/s (CW) and 45.03 rad/s (CW) respectively.



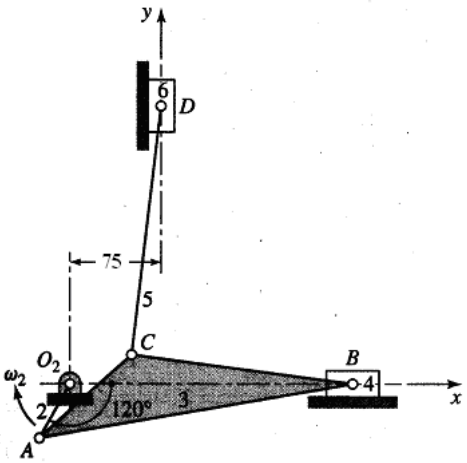
(a) Draw the configuration diagram using a scale of 1 cm = 100 mm

(b) Draw the acceleration polygon to a scale of 1 cm = 250 m/s^2.

(c) Determine the angular accelerations of the coupler AB and the drag-link O_4B

Question 2:

Crank O_2A of a drag-link mechanism rotates at a constant angular velocity of 50 rad/s in the counter-clockwise sense. Here, O_2A = 50 mm, AB = 250 mm, BC = 175 mm, CA = 100 mm and CD = 200 mm. For the configuration shown, crank O_2A makes 120˚ with O_2B. From the velocity analysis, the angular velocities of plate 3 and link 4 were found to be 5.077 rad/s (CW) and 9.091 rad/s (CW) respectively.



(a) Draw the configuration diagram to a scale of 1 cm = 50 mm

(b) Draw the acceleration polygon to a scale of 1 cm = m/s^2

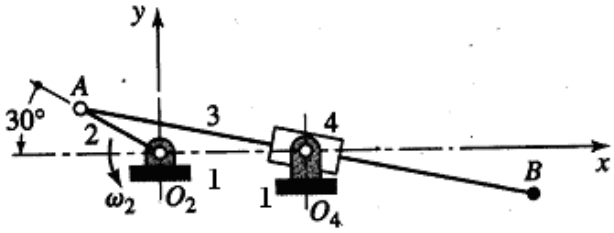
(c) Determine,

(i) the angular accelerations if plate 3 and link 4

(ii) the accelerations of sliders C and D

Question 3:

Crank O_2A of the mechanism, rotates at a constant angular velocity of 50 rad/s in the counter-clockwise sense. Here, O_2O_4 = 200 mm, O_2A = 100 mm and AB = 400 mm. For the configuration shown, crank O_2A makes 150˚ with the line of centers O_2O_4. Velocity analysis gives the angular velocity of the oscillating link 3 as 16.14 rad/s (CCW) and the velocity of link 3 in collar 4 as 1.719 m/s in the direction $B\vec{A}$.



(a) Draw the configuration diagram using a scale of 1 cm = 50 mm

(b) Draw the acceleration polygon to a scale of 1 cm = 50 m/s^2

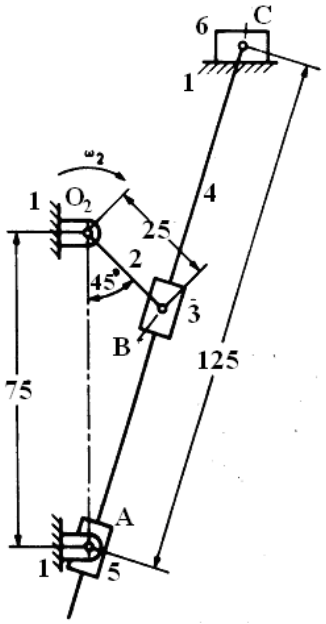
(c) Determine

(i) the angular acceleration of link AB

(ii) the acceleration of point B

Question 4:

In the mechanism shown, the rotation of the crank O_2B imparts a reciprocating motion to slider C. For the configuration shown the velocity and acceleration of the slider are 3 m/s (rightward) and 850 m/s^2 (leftward) respectively. Velocity analysis gives the angular velocities of crank 2 and link 4 as 117.8 rad/s (CCW) and 22.94 rad/s (CW) respectively. Further, the sliding velocities of collars 3 and 5 on link 4 are 1.719 m/s (upward) and 0.884 m/s (downward) respectively.



(a) Draw the configuration diagram to a scale of 1 cm = 25 mm

(b) Draw the acceleration polygon to a scale of 1 cm = 50 m/s^2

(c) Determine,

(i) the angular acceleration of link 4

(ii) the angular acceleration of crank 2

(iii) the acceleration of sliding of link 4 relative to collar 5

(iv) the velocity of sliding of collar 3 relative to link 4