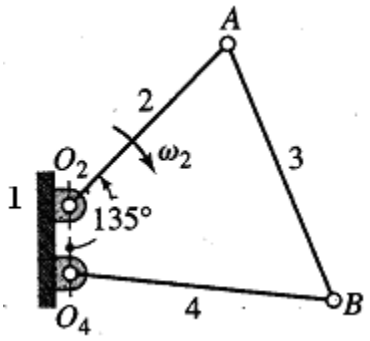
CONCORDIA UNIVERSITY
Faculty of Engineering and Computer Science
Department of Mechanical and Industrial Engineering

MECH 343/2 X: Theory of Machines 1

Assignment 4:

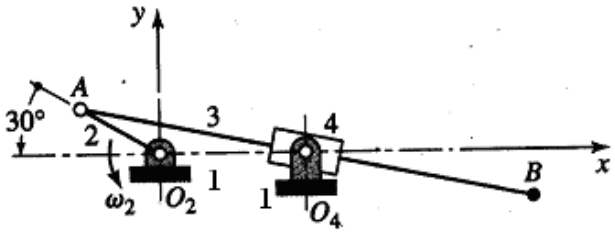
Question 1:



Crank O_2A of a drag-link mechanism rotates at 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.

(a) Draw the configuration diagram using a scale of 1 cm = 100 mm
(b) Locate all centers of rotations of this mechanism
(c) Determine the angular velocities of the coupler AB and the drag-link O_4B
(d) Calculate the relative angular velocities $\omega_{3|2}$, $\omega_{4|3}$

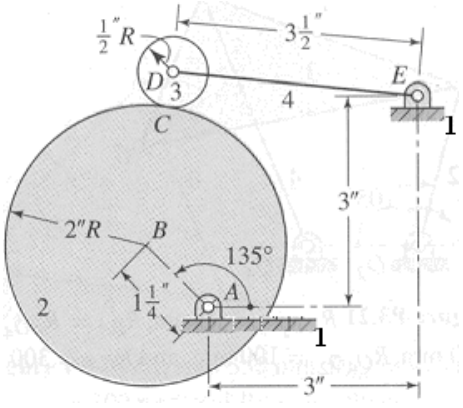
Question 2:



Crank O_2A of the mechanism, rotates at 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.

(a) Draw the configuration diagram using a scale of 1 cm = 100 mm
(b) Locate all centers of rotations of the mechanism
(c) Determine
  (i) the angular velocity of link AB
  (ii) the velocity of point B

Question 3:

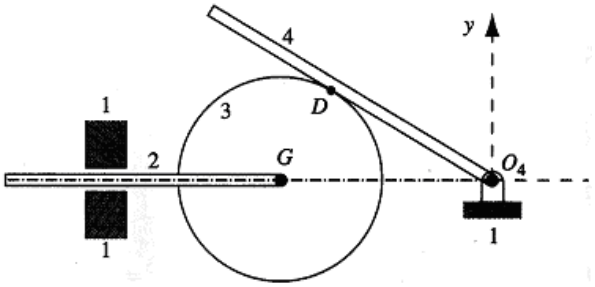


The circular cam 2 rotates at 25 rad/s in the clockwise sense. Roller 3 rolls without slipping on the cam surface. The necessary dimensions are shown in Figure.

(a) Draw the configuration using a scale 1 cm = 0.5 in
(b) Locate all centers of rotations of the mechanism
(c) Determine the angular velocities of the roller 3 and the follower 4

Question 4:

In the mechanism, the linear motion of link 2, creates a rocking motion to the follower 4. Roller 3 rolls on the follower 4 without slipping. For the configuration shown, DG = 150 mm and O4G = 300 mm.. The input link moves to the right at 100 mm/s.



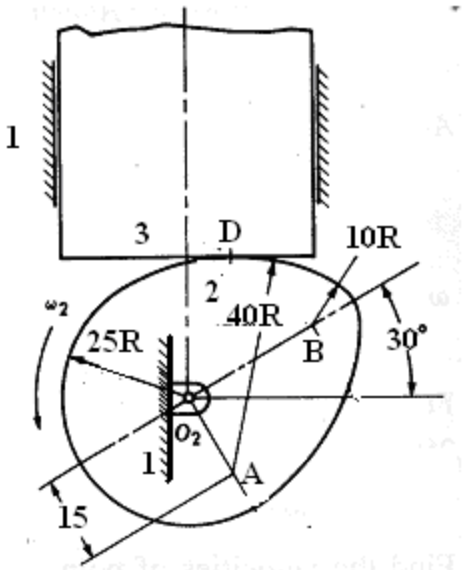
(a) Draw the configuration diagram to the scale of 1 cm = 50 mm

(b) Locate all centers of rotations

(c) Determine the angular velocities of Roller 3 and the follower 4

Question 5:

The cam profile 2 shown consists of four circular arcs. Here O_2A is perpendicular to O_2B. Cam, which rotates at 50 rad/s in counter-clockwise sense, imparts reciprocating motion to a flat footed follower 3. The dimensions are shown in Figure.



(a) Draw a full size configuration diagram

(b) Locate all centers of rotations

(c) Determine

(i) the velocity of the follower

(ii) the velocity of rubbing at the contact point D