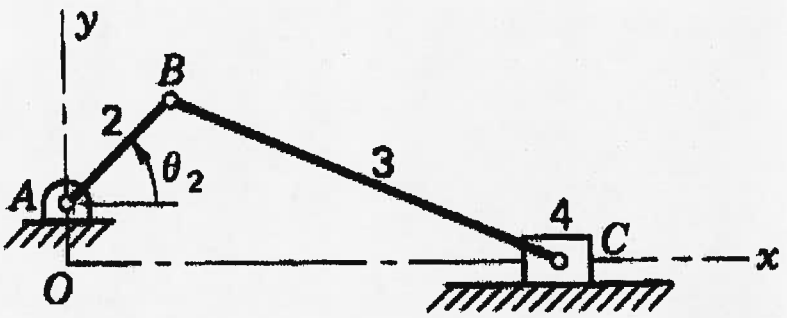
Mechanical Industrial Engineering Department, Concordia University

MECH 343/4 T and M: Theory of Machines 1

Assignment 3

Question 1:

Crank (2) of the off-set slider crank mechanism rotates at a constant angular velocity of 100 rad/s in CW sense. Here, OA = 25 mm, AB = 50 mm and BC = 200 mm. For the configuration shown $\theta_2 = 60°$.



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

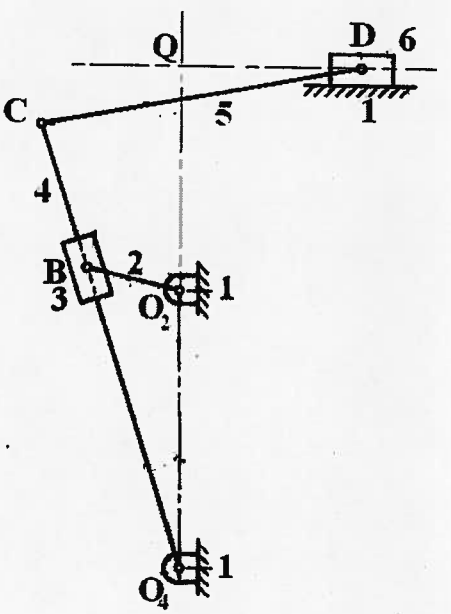
(b) Determine,

(i) the stroke length of slider (4)

(ii) the durations of the leftward and rightward strokes of slider (4)

Question 2:

Crank (2) of Whitworth quick return mechanism rotates at constant angular velocity. The rightward stroke of the slider (6) is used for shaping. The leftward return stroke is quicker than the shaping stroke. Here, O_2O_4 = 600 mm, O_2B = 300 mm, O_4C=900 mm, O_4Q = 850 mm and CD = 400 mm. Determine,



(a) Draw the two configurations corresponding to the extreme positions of slider (6) on the same diagram to the scale of 1 cm = 100 mm.

(b) Determine,

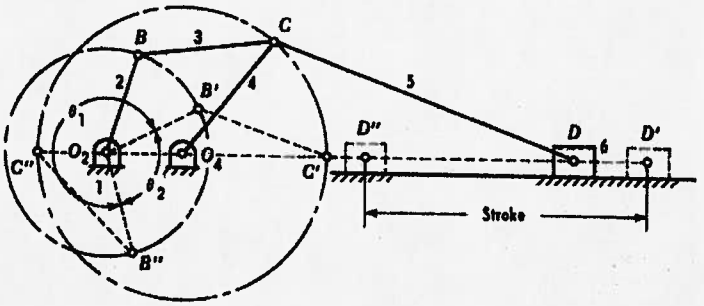
(1) the sense of rotation of crank (2)

(2) the stroke of slider (6)

(3) the ratio of the duration of the shaping stroke to that of the return stroke

Question 3:

Crank (2) of the four-bar linkage rotates at constant angular velocity in CCW sense. Its motion imparts a reciprocating motion to slider (6). Here, O_2O_4 = 100 mm, O_2B = 150 mm, BC = 250 mm, O_4C = 250 mm and CD = 550 mm.



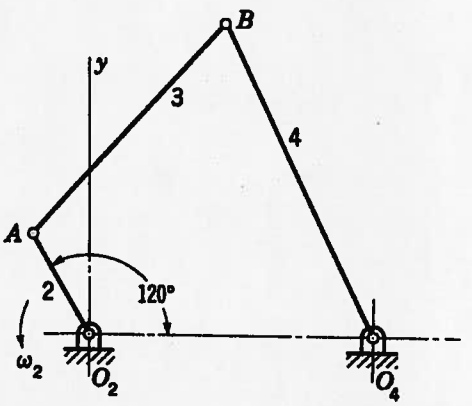
(a) Verify that the four-bar linkage is a double-crank.

(b) Draw the two configurations corresponding to the extreme positions of slider (6) on the same diagram, using a scale of 1 cm = 50 mm.

(c) Determine the ratio of the duration of leftward stroke to that of the rightward stroke

Question 4:

Crank (2) of the four-bar linkage shown rotates in the counter-clockwise sense at constant angular velocity. Here, O_2O_4 = 250 mm, O_2A = 100 mm, AB = 250 mm and O_4B = 300 mm.



(a) Verify that this four-bar linkage is a crank-rocker

(b) Draw the two configurations of the mechanism corresponding to the extreme positions of rocker (4) on the same diagram using a scale of 1 cm = 100 mm.

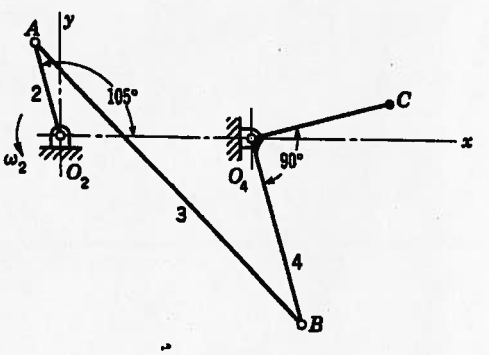
(c) Determine,

(1) the angle through which rocker (4) rocks

(2) the time ratio for CW to CCW rocking of rocker

Question 5:

Link (2) drives the four-bar linkage shown drives the mechanism at constant angular velocity in CW sense. C is the coupler point in output-link (4). Here, O_2O_4 = 250 mm, O_2A = 100 mm, AB = 300 mm, O_4B = 200 mm and O_4C = 100 mm.



(a) Verify that the four-bar linkage is a crank-rocker.

(b) Draw the two configurations corresponding to the extreme positions of link (4) on the same diagram using a scale of 1cm = 50 mm.

(c) Determine,

(1) the angle through which rocker (4) rocks

(2) the time ratio for CW to CCW rocking of rocker