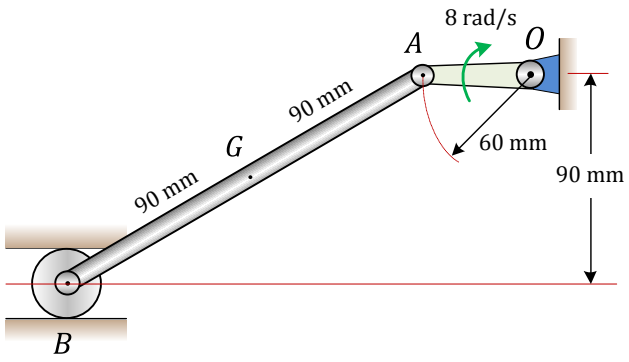
MMAN2300 Engineering Mechanics 2
Part B: Rigid Body Dynamics
Problem solving session – 2
WEEK 8_S2_2018

Question 1:

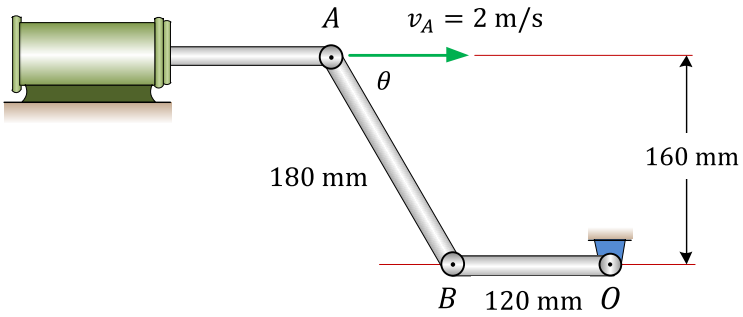
When crank *OA* passes the horizontal position as shown below, determine the velocity of the centre *G* of link *AB* using the method of instant centres.



$[v_G = 0.277 \text{ m/s}]$

Question 2:

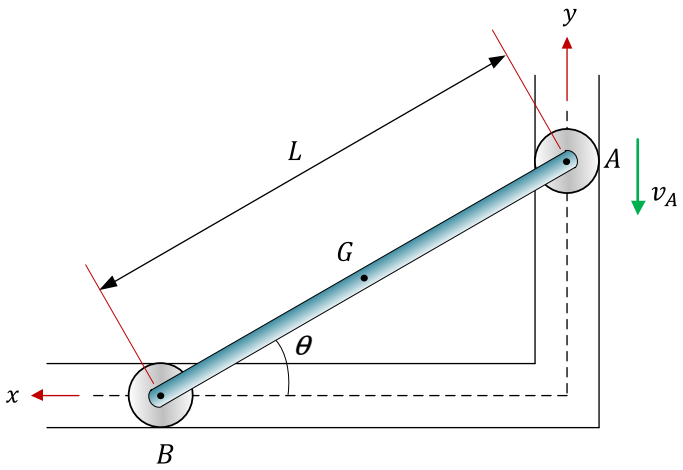
Horizontal motion of the piston rod of the hydraulic cylinder controls the rotation of link *OB* about *O*. For the instant shown, v_A = 2 m/s and *OB* is horizontal. Use the method of instant centres to solve for the angular velocity of *OB*.



$[\omega_{OB} = 8.58 \text{ rad/s CCW}]$

Questions 3-4:

The rigid link *AB* is 221 mm long and has a roller at each end. The rollers are constrained to move in the guides. The end *A* has a constant velocity of 7.6 m/s in the direction shown, and at this instant θ = 27.4°. Find the angular velocity of link *AB* and the velocity of roller *B* at this instant.



[$\omega_{AB} =$ 38.735 rad/s CW; $v_B =$ 3.940 m/s ←]

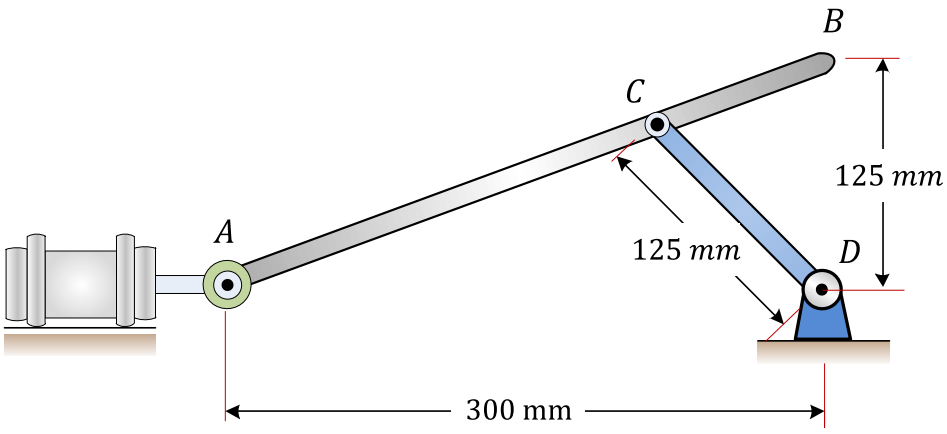
Questions 5-7:

Movement of the solenoid plunger shown below gives pin *A* of the mechanism a velocity of 125 mm/s horizontally to the right for some short interval of its motion. For this instant, determine:

(a) the angular velocity ω_{AB} using the method of instant centres,

(b) the angular velocity ω_{CD},

(c) the velocity v_B of pin *B*.



[$\omega_{AB} =$ 0.42 rad/s CCW; $\omega_{CD} =$ 1.0 rad/s CW; $v_B =$ 145.34 m/s]

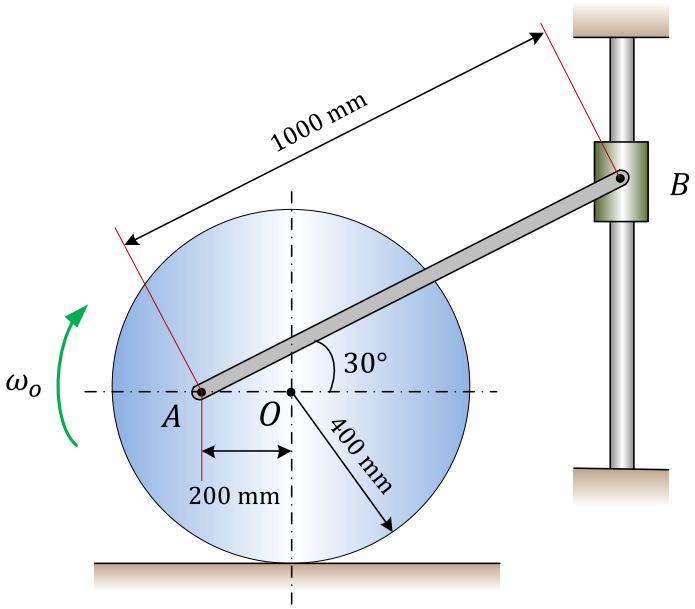
Questions 8-9:

The wheel in figure shown, rolls without slipping with the constant clockwise angular velocity ω_O = 2 rad/s.

(a) Calculate the angular velocity of bar *AB*.

(b) Calculate the velocity of the slider *B* when the mechanism is in the position shown.

Use the instant centre method, and an analytical solution is required.



[$\omega_{AB} =$ 1.6 rad/s CCW; $v_B =$ 1.79 m/s ↑]