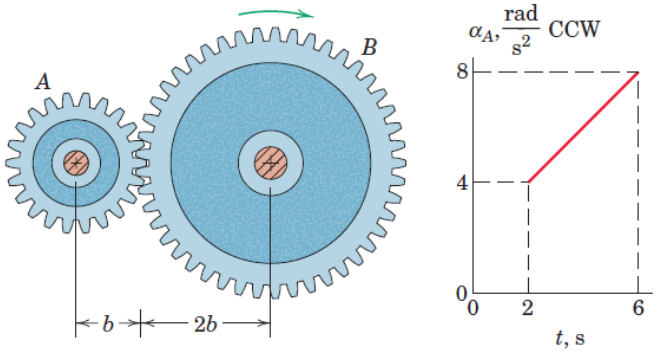
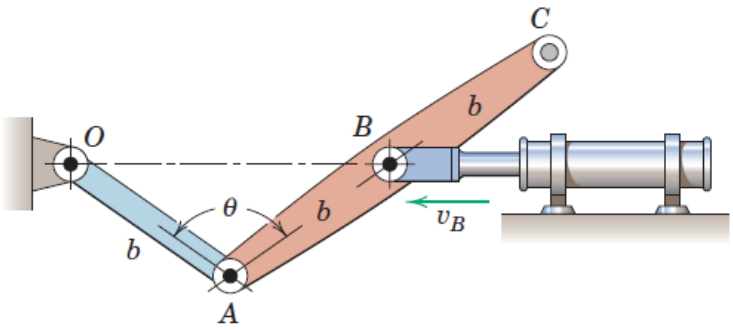
DYNAMICS (ME232)

Tutorial-5: Plane Kinematics of Rigid Bodies

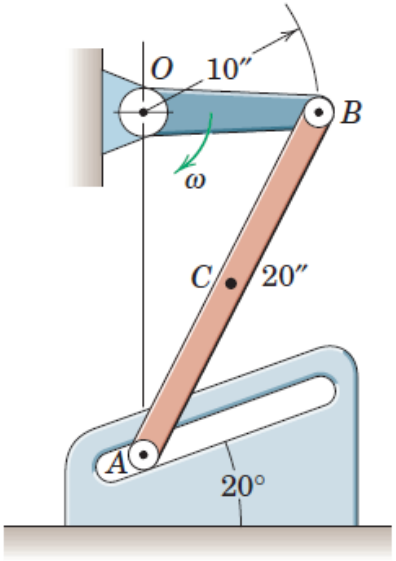
1. The design characteristic of a gear-reduction unit are under review. Gear B is rotating clockwise with a speed of 300 rev/min when a torque is applied to gear A at time $t = 2s$ to give gear A a counterclockwise acceleration α which varies with time for a duration of 4 seconds as shown. Determine the speed N_B of gear B when t=6 s.



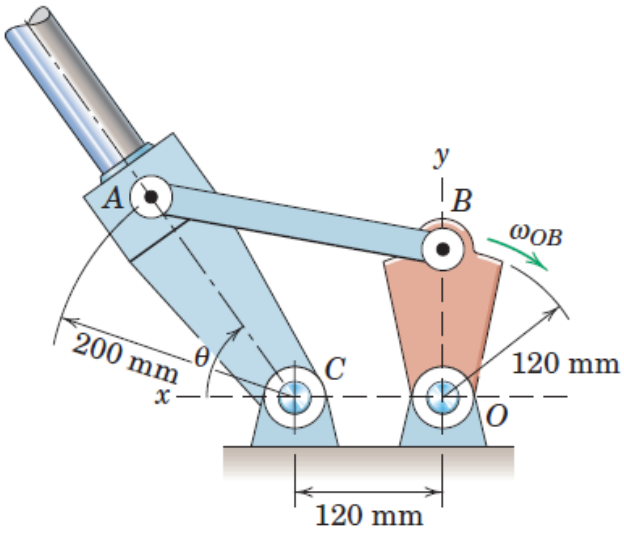
2. The piston rod of the hydraulic cylinder gives point B a velocity v_B as shown. Determine the magnitude v_C of the velocity of point C in terms of θ.



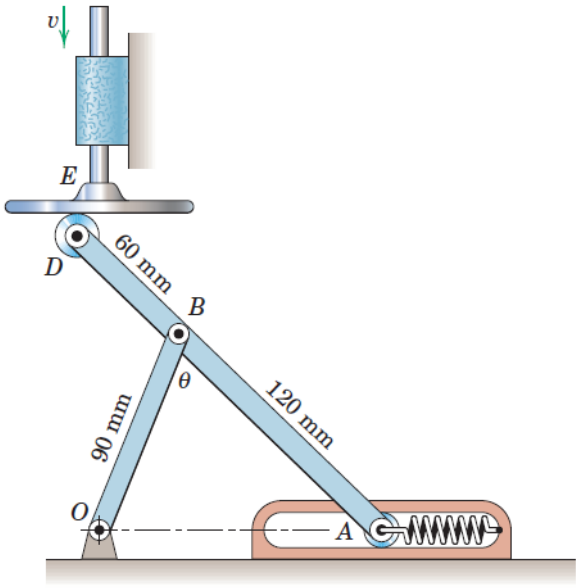
3. For the instant represented, crank OB has a clockwise angular velocity $\omega = 0.8$rad/sec and is passing the horizontal position. Determine the corresponding velocity of the guide roller A in the 20° slot and the velocity of point C midway between A and B.



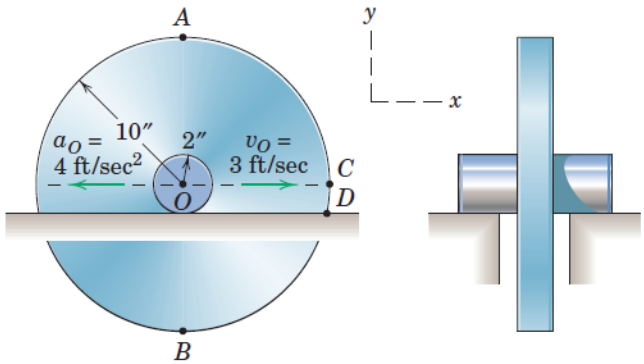
4. The element of the mechanism for deployment of a spacecraft magnetometer boom are shown. Determine the angular velocity of the boom when the driving link OB crosses the y-axis with an angular velocity $\omega_{OB} = 0.5$ rad/s if $\tan\theta$=4/3 at this instant.



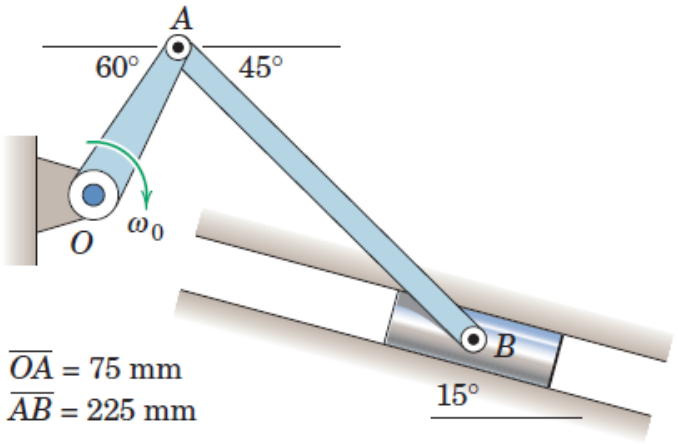
5. Motion of the roller A against its restraining spring is controlled by the downward motion of the plunger E. For an interval of motion the velocity of E is $v = 0.2$ m/s. Determine the velocity of A when θ becomes 90°



6. The shaft of the wheel unit rolls without slipping on the fixed horizontal surface. If the velocity and acceleration of point O are 3 ft/sec to the right and 4 ft/sec^2 to the left, respectively, determine the accelerations of point A and D.



7. The crank OA of the offset slider-crank mechanism rotates with a constant clockwise angular velocity ω_O=10 rad/s. Determine the angular acceleration of link AB and the acceleration of B for the depicted position.



8. For the instant represented, link CB is rotating counterclockwise at a constant rate $N = 4$ rad/sec, and its pin A causes a clockwise rotation of the slotted member ODE. Determine the angular velocity ω and angular acceleration α of ODE for this instant.