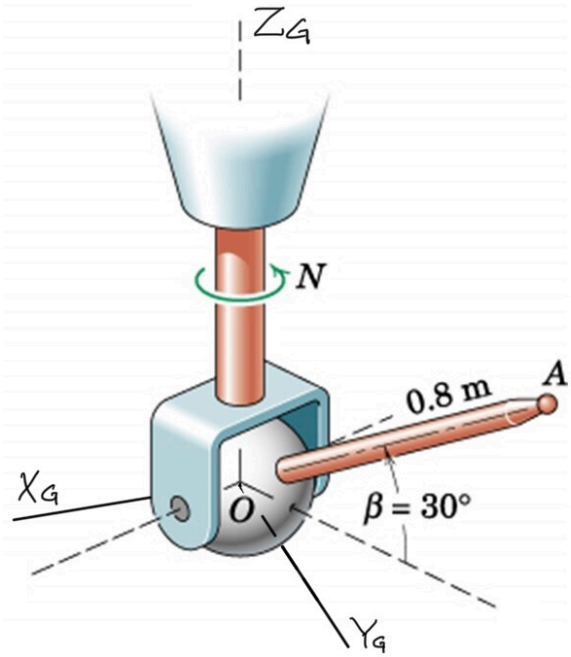
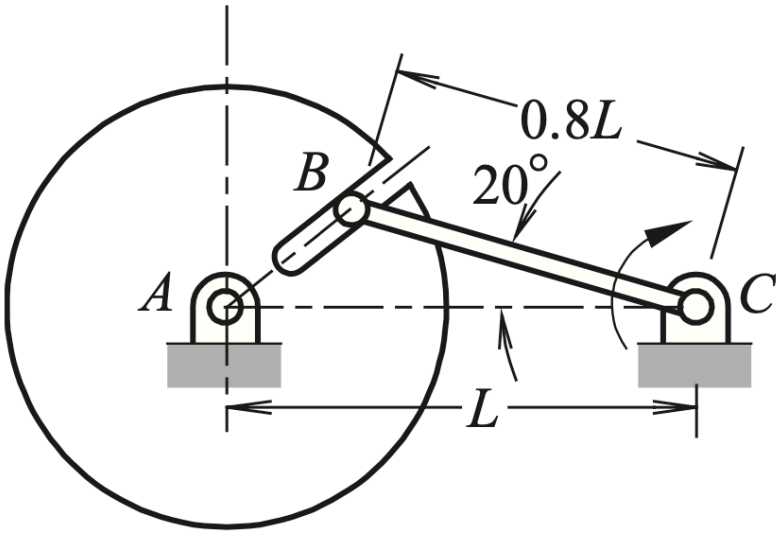
ESO209A: Dynamics: **Tutorial 6**
(Week: 1 - 7 Sep. Based on L10 and L11)

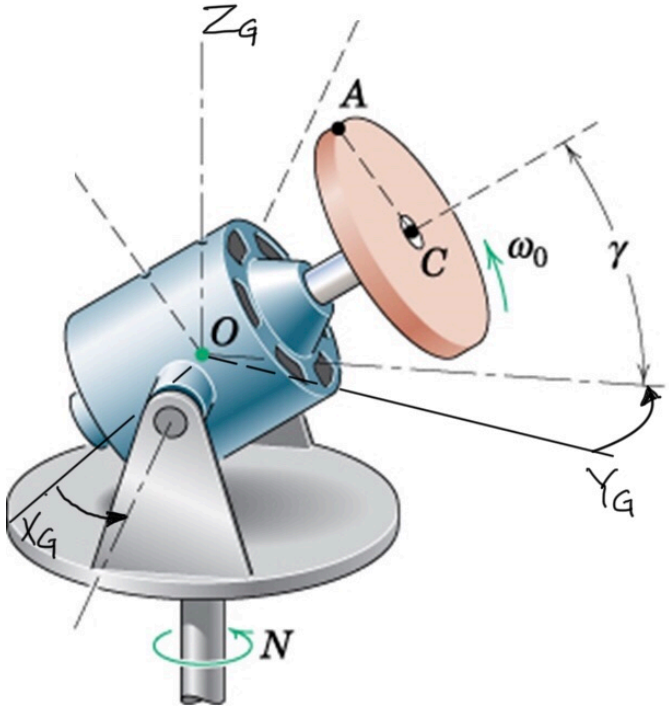
1. The arm *OA* is fitted in a bracket which is rotating about ground *Z*-axis at $N = 60$ rpm. The arm is also turning about one of its own axis at $\dot{\beta} = 2\pi$ rad/sec in the direction as shown in the figure. Find the angular velocity and *angular acceleration* of the arm in the ground frame at the instant when both, the ground and the arm frames coincide.



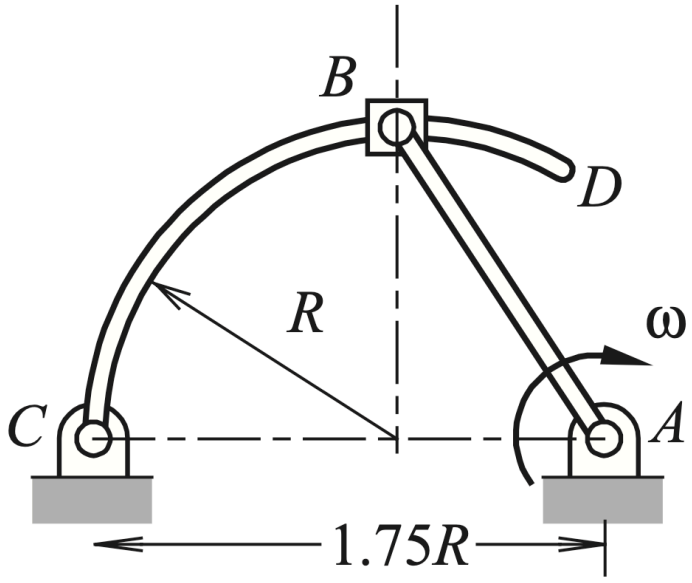
2. The figure below shows a mechanism in which the slotted disk rotates at the angular speed ω_D. Determine the angular velocity of the connecting rod *BC* at the instant shown.



3. A disc is mounted on the shaft of a motor which in turn is mounted on a turn table. The turn table rotates about ground fixed Z-axis at $N = 60$ rpm and the motor spins about its axis at 180 rpm. For $\gamma = 30^0$ determine,
   (i) The angular velocity and *angular acceleration* of the disc in ground frame at the instant when both, the ground and the motor frames coincide.
   (ii) The linear velocity and acceleration of point A on the disc in ground frame at the instant when both, the ground and the motor frames coincide. Take $OC = 2AC = 250$ mm.



4. The bar AB in the figure below rotates at the constant rate ω_{AB}, which causes the collar B to slide along the curved bar CD. For the instant shown, find the angular velocity of the curved bar CD and the velocity of the collar B.



5. A barrel, spinning about its axis is mounted on a turret through trunnion pin *AB*. The turret itself is spinning about the ground Z_G axis, as shown in the figure. The barrel can rotate about the pin *AB*. For the given constant angular rates $\Omega_T = \Omega_B = 2\pi$ rad/sec and constant rate of elevation $\dot{\theta} = \frac{\pi}{4}$ rad/sec find the angular velocity and *angular acceleration* of the barrel as observed in the ground frame $\mathscr{E}_G$ at the instant when the turret frame $\mathscr{E}_T$ coincides with $\mathscr{E}_G$, and the barrel elevation in the *YZ* plane is $\theta = \pi/6$ radian.