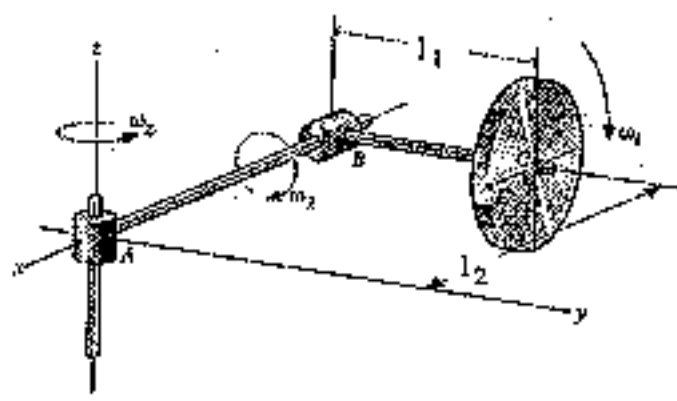
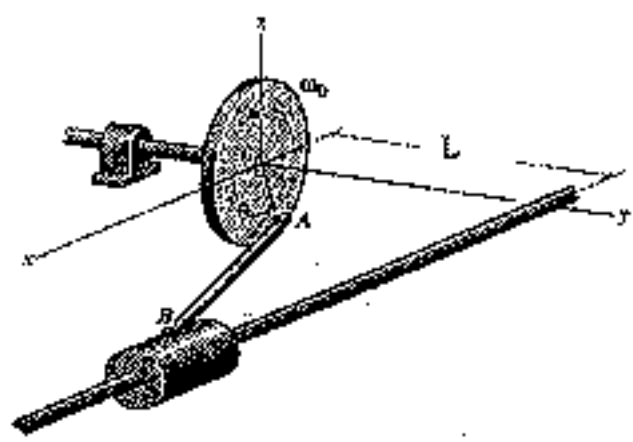


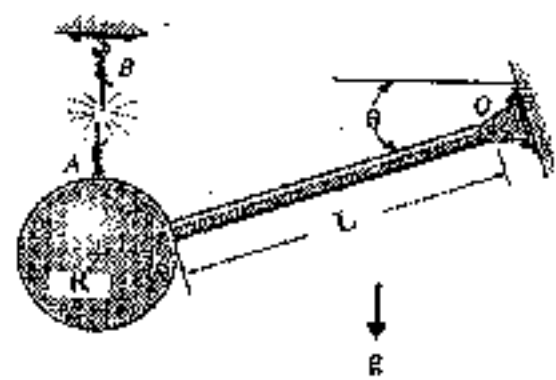
25% 1. The pipe  $l_2$  is rotating about a vertical axis at a rate of  $\omega_2$ . At the same time, the pipe  $l_1$  is rotating about  $l_2$  at a rate of  $\omega_2$  and the  $R$  radius disk rotates about pipe  $l_1$  at a rate of  $\omega_1$ . For the instant  $CD$  is vertical to the plane  $ABC$ , determine the velocity  $v_D$  and the acceleration  $a_D$  of point  $D$  on the rim of the disk.



25% 2. The  $R$  radius wheel is rotating at a constant rate  $\omega_0$ . The  $l_1$  slender rod  $AB$  is connected to the rim of the wheel at  $A$  and to the slider  $B$  by ball-and-socket joints. For the instant shown when  $\theta = 90^\circ$ , determine the angular velocity  $\omega$  and angular acceleration  $\alpha$  of the rod. Assume that the rod is not rotating about its own axis.



25% 3. The pendulum consists of a mass  $M$  sphere of  $R$  radius and a mass  $m$  slender rod of  $L$  length. Compute the angular acceleration of the pendulum and the reaction at the pin  $O$  right after the cord  $AB$  is cut.



25% 4. The stand of a electric fan is mounted on a fixed support. The moving part of the fan rotates about the  $z$  axis at a constant rate of  $\omega_z$  and about  $x$  axis at  $\phi = a \sin(\omega_z t)$ , and the fan blade is spinning at a constant rate of  $\omega_c$ . Determine the reaction forces and moments at the fixed support. Define necessary parameters of the system for determining the reaction forces and moments.

