Physics
Quiz # 6

Date Given: May 19, 2022
Date Due: May 26, 2022

Q1. (1 point) Space curvilinear motion can be completely specified by using:

(a) Two independent coordinates plus a third coordinate dependent upon one of the independent coordinates.

(b) Two independent coordinates.

(c) One coordinate along the radial direction between the origin and the location of the particle.

(d) Three independent coordinates.

Q2. (1 point) Cylindrical coordinates use coordinates that consist of:

(a) The distance along the path and two angles.

(b) The distance from the vertical axes, the height, and the angle in the plane perpendicular to the vertical axis.

(c) A radial distance and two angles.

(d) A radial distance and three angles.

Q3. (1 point) Spherical coordinates use coordinates that consist of:

(a) A radial distance and an angle in a plane plus an axis perpendicular to the plane.

(b) The distance along the path and two angles.

(c) A radial distance and two angles.

(d) A radial distance and three angles.

Q4. (3 points) The arm of the robot moves so that $r = 1$ m is constant, and its grip A moves along the path $z = (\sin\theta)$ m, where θ is in radians. If $\theta = \pi t/8$ rad, where t is in seconds, determine the magnitudes of the grip's velocity and acceleration when $t = 4$s.

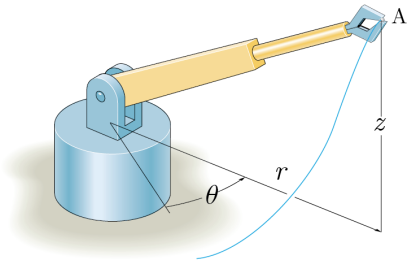

Figure 1: Illustration to Problem 4.

Q5. (2 points) The disk A rotates about the vertical z-axis with a constant speed $\omega = \dot{\theta} = \pi/3$ rad/s. Simultaneously, the hinged arm OB is elevated at the constant rate $\dot{\varphi} = 2\pi/3$ rad/s. At time $t = 0$, both $\theta = 0$ and $\varphi = 0$. The angle θ is measured from the fixed reference x-axis. The small sphere P slides out along the rod according to $R = 50 + 200t^2$, where R is in millimeters and t is in seconds. Determine the magnitude of the total acceleration $\boldsymbol{a}$ of P when $t = 1/2$ s.

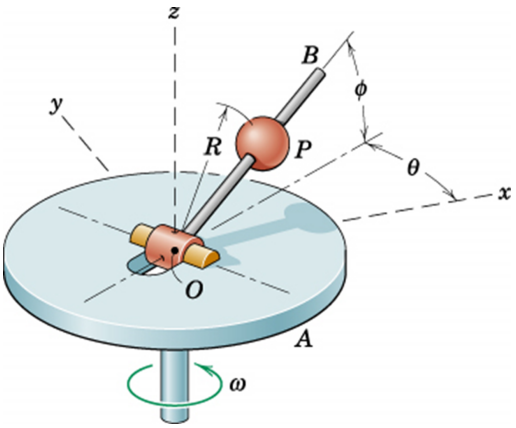

Figure 2: Illustration to Problem 5.