Q2. Given vector $\vec{A}(x,y,z) = y\hat{\imath} + (x+z)\hat{\jmath}$ in Cartesian coordinate system at point P(-2,6,3). Convert the vector $\vec{A}$ into cylindrical and spherical coordinates.

Given:- $\vec{A} = y\hat{\imath} + (x+z)\hat{\jmath}$, x=-2, y=6, z=3

Formula:- Cylindrical- Cartesian $r = \sqrt{x^2+y^2}$; $\emptyset = tan^{-1}\left(\frac{y}{x}\right)$; $z = z$

Spherical-Cartesian;

$r = \sqrt{x^2+y^2+z^2}$; $\theta = \tan^{-1}\left(\frac{\sqrt{x^2+y^2}}{z}\right)$; $\emptyset = tan^{-1}\left(\frac{y}{x}\right)$

Solution:-

Cylindrical coordinates:

$$r = \sqrt{(-2)^2+6^2} = 6.32$$

$$\emptyset = \frac{6}{-2} = 108.43^{\circ}$$

Z=3

Spherical coordinates:

$$r = \sqrt{(-2)^2+6^2+3^2} = 7$$

$$\theta = \frac{\sqrt{(-2)^2+6^2}}{3} = 64.62^{\circ}$$

$$\emptyset = \frac{6}{-2} = 108.43^{\circ}$$

Ans:- $\vec{A} = (6.32\,\hat{r},\ 108.43\,\hat{\emptyset},\ 3\,\hat{z})$ **is cylindrical coordinates**

$\vec{A} = (7\,\hat{r},\ 64.62\,\hat{\theta},\ 108.43\,\hat{\emptyset})$ **is spherical coordinates.**