Tian Xiaoyang
26001904581

P1.

$r = 3$

$\dot{\theta} = 2, \theta = 2t$

$v_r = \dot{r} = 0$

$v_\theta = r\dot{\theta} = 3 \times 2 = 6$

$v_z = \dot{z} = 4\cos2t$

$v_{zmax} = \cos2t = 1$

$v_{zmin} = \cos2t = 0$

$v_{max} = \sqrt{36 + 16} = 2\sqrt{13}$

$v_{min} = \sqrt{36} = 6$

P2.

$v = \dfrac{v_\theta}{\cos\gamma} \quad v_\theta = v\cos\gamma = 4\sqrt{3}$

$v_z = v\sin\gamma = 8\sin30° = 4m/s$

$v = \sqrt{v_\theta{}^2 + v_z{}^2} = 2\sqrt{7} = 5.29$

P3.

$\varphi = 90° - \beta = 60°$

$\dot{\varphi} = \ddot{\varphi} = 0$

$\theta = 120t$

$\dot{\theta} = 120rev/min = 2\,rev/s = 2\pi/s$

$\ddot{\theta} = 0$

$R = 200 + 50\sin4\pi t$

$\dot{R} = 200\pi\cos4\pi t$

$\ddot{R} = -800\pi^2\sin4\pi t$

$v_\varphi = r\dot{\varphi} = 0$

$$v_{r\,max} = \dot{r} = 200\pi cos4\pi t = 200\pi cos2\pi = 200\pi, t = \frac{1}{2}$$

$$v_{\theta\,max} = r\dot{\theta}cos\varphi = (200 + 50sin4\pi t)2\pi\,cos\frac{\pi}{3} = \Big(200 +$$
$$50sin\frac{\pi}{2}\Big)2\pi cos\frac{\pi}{3} = 250\pi, t = \frac{1}{8}$$

$$t = \frac{1}{2}$$
$$v_{r\,max} = 200\pi$$
$$v_{\theta\,max} = 200\pi$$

$$t = \frac{1}{8}$$
$$v_{r\,max} = 444.288$$
$$v_{\theta\,max} = 250\pi$$

$$200\pi + 200\pi > 250\pi + 444.288$$
$$v = \sqrt{v_r{}^2 + v_\theta{}^2} = 20\pi = 62.832m/s$$

P4.
$$\varphi = \frac{\pi}{4}$$