7. $\iiint_E x^2 \, dV$ $\quad x^2+y^2=1 \quad z=0 \quad z^2=4x^2+4y^2$

$r^2=1 \qquad z^2=4r^2$

$r=1 \qquad z=2r$

$\theta \in [0, 2\pi] \qquad 0=4r^2 \qquad z \in [0, 2r]$

$r=0 \quad r \in [0,1]$

$E = \{(r,\theta,z) \mid \theta \in [0,2\pi] \wedge r \in [0,1] \wedge z \in [0,2r]\}$

$$\int_0^{2\pi} \int_0^1 \int_0^{2r} r^3 \cos^2\theta \, dz \, dr \, d\theta$$

$$= \int_0^{2\pi} \cos^2\theta \, d\theta \int_0^1 \left[ r^3 z \right]_0^{2r} dr = \int_0^{2\pi} \left[\tfrac{1}{2} + \tfrac{1}{2}\cos 2\theta\right] d\theta \int_0^1 2r^4 \, dr$$

$$= \int_0^{2\pi} \left[\tfrac{1}{2} + \tfrac{1}{2}\cos 2\theta\right] d\theta \left[\tfrac{2}{5} r^5\right]_0^1 = \tfrac{2}{5} \int_0^{2\pi} \left[\tfrac{1}{2} + \tfrac{1}{2}\cos 2\theta\right] d\theta$$

$$= \frac{2}{5}\left[\frac{\theta}{2} + \frac{\sin 2\theta}{4}\right]_0^{2\pi} = \frac{2}{5}\left[\pi + 0 - 0 - 0\right] = \boxed{\frac{2\pi}{5}}$$