$$I_1 = \int_0^{2\pi} \left(\frac{a}{\sqrt{6}}\operatorname{sen} t - \frac{a}{\sqrt{2}}\cos t\right)\left(-\frac{a}{\sqrt{2}}\operatorname{sen} t + \frac{a}{\sqrt{6}}\cos t\right) dt =$$

$$= \int_0^{2\pi} \left(-\frac{a^2}{12}\operatorname{sen}^2 t + \frac{a^2}{6}\operatorname{sen} t\cos t + \frac{a^2}{6}\operatorname{sen} t\cos t - \frac{a^2}{12}\cos^2 t\right) dt$$

$$= -\frac{a^2}{12}\int_0^{2\pi} (\operatorname{sen}^2 t + \cos^2 t)\, dt + \frac{2a^2}{3}\int_0^{2\pi} \operatorname{sen} t\cos t\, dt =$$

$$= -\frac{a^2 2\pi}{12} + \frac{a^2}{3}\operatorname{sen}^2 t\Big]_0^{2\pi} = -\frac{a^2\pi}{6}$$

$$I_2 = \int_0^{2\pi} \left(-a\sqrt{\frac{2}{3}}\operatorname{sen} t\right)\left(\frac{a\cos t}{\sqrt{6}} + \frac{a\operatorname{sen} t}{\sqrt{2}}\right) dt =$$

$$= \int_0^{2\pi} \left(-a^2\sqrt{\frac{2}{3\cdot 6}}\operatorname{sen} t\cos t - a^2\sqrt{\frac{2}{3\cdot 2}}\operatorname{sen}^2 t\right) dt =$$

$$= -\frac{a^2}{6}\int_0^{2\pi} 2\operatorname{sen} t\cos t\, dt - \frac{a^2}{\sqrt{3}}\int_0^{2\pi} \operatorname{sen}^2 t\, dt =$$

$\operatorname{sen}^2 t + \cos^2 t = 1$
$\cos^2 t - \operatorname{sen}^2 t = \cos 2t$

$$= -\frac{a^2}{6}\operatorname{sen}^2 t\Big]_0^{2\pi} - \frac{a^2}{2\sqrt{3}}\left(\int_0^{2\pi} dt - \int_0^{2\pi} \cos 2t\, dt\right) = -\frac{a^2}{2\sqrt{3}}\left(2\pi - \frac{\operatorname{sen} 2t}{2}\Big]_0^{2\pi}\right)$$

$$= -\frac{a^2\pi}{\sqrt{3}}$$

$$I_3 = \int_0^{2\pi} \left(\frac{a}{\sqrt{2}}\cos t + \frac{a}{\sqrt{6}}\operatorname{sen} t\right)\left(-a\sqrt{\frac{2}{3}}\cos t\right) dt =$$

$$= \int_0^{2\pi} \left(-\frac{a^2}{\sqrt{3}}\cos^2 t - \frac{a^2\cdot\sqrt{2}}{\sqrt{6}\cdot 3}\operatorname{sen} t\cos t\right) dt = -\frac{a^2}{\sqrt{3}}\int_0^{2\pi} \cos^2 t\, dt - \frac{a^2}{6}\int_0^{2\pi} 2\operatorname{sen} t\cos t\, dt =$$

$$= -\frac{a^2}{2\sqrt{3}}\left(\int_0^{2\pi} dt + \int_0^{2\pi} \cos 2t\, dt\right) - \frac{a^2}{6}\cdot\operatorname{sen}^2 t\Big]_0^{2\pi} = -\frac{a^2\pi}{\sqrt{3}} - \frac{a^2}{2\sqrt{3}}\frac{\operatorname{sen} 2t}{2}\Big]_0^{2\pi} =$$

$\operatorname{sen}^2 t + \cos^2 t = 1$
$\cos^2 t - \operatorname{sen}^2 t = \cos 2t$

$$= -\frac{a^2\pi}{\sqrt{3}}$$