6.3 A

4.(3) 令 $x=\rho\cos\theta,\ y=\rho\sin\theta$，$\iiint\limits_V \frac{e^z}{\sqrt{x^2+y^2}}dV=\iiint\limits_V \frac{1}{\rho}e^z\rho\, d\rho\, d\theta\, dz$

$\therefore$ 原积分 $=\iiint\limits_V e^z d\rho\, d\theta\, dz = \int_0^{2\pi}d\theta\int_0^z d\rho\int_1^2 e^z dz$

$=\int_0^{2\pi}d\theta\cdot\int_1^2 ze^z dz = 2\pi e^2$

(10) (V)：$x^2+y^2+z^2\le R^2$ 与 $x^2+y^2+(z-R)^2\le R^2$ 的公共区域.

令 $x=\rho\cos\theta,\ y=\rho\sin\theta$，则区域为 $\begin{cases}0\le\theta\le 2\pi\\ 0\le\rho\le\sqrt{R^2-z^2}\\ \frac{1}{2}R\le z\le R\end{cases}$ 和 $\begin{cases}0\le\theta\le 2\pi\\ 0\le\rho\le\sqrt{2Rz-z^2}\\ 0\le z\le\frac{1}{2}R\end{cases}$

$\therefore\iiint\limits_V z^2 dV=\int_0^{2\pi}d\theta\int_0^{\sqrt{R^2-z^2}}\rho\, d\rho\int_{\frac{1}{2}R}^{R}z^2dz+\int_0^{2\pi}d\theta\int_0^{\sqrt{2Rz-z^2}}\rho\, d\rho\int_0^{\frac{1}{2}R}z^2dz$

$=\left(\frac{1}{15}-\frac{1}{192}\right)R^5$

(11) 设 $x=r\sin\varphi\cos\theta,\ y=r\sin\varphi\sin\theta,\ z=r\cos\varphi$

$\therefore\iiint\limits_V r^5\sin^3\varphi\cos\varphi\sin\theta\cos\theta\, d\theta\, d\varphi\, dr.$

$=\int_0^1 r^5dr\cdot\int_0^{\frac{\pi}{2}}\sin^3\varphi\cos\varphi\, d\varphi\int_0^{\frac{\pi}{2}}\sin\theta\cos\theta\, d\theta$

$=\frac{1}{6}\cdot\int_0^1\sin^3\varphi\, d(\sin\varphi)\cdot\int_0^1\sin\theta\, d(\sin\theta)$

$=\frac{1}{6}\cdot\frac{1}{4}\cdot\frac{1}{2}=\frac{1}{48}$

5.(2) 积分域：$\Omega:\begin{cases}-3\le x\le 3\\ -\sqrt{9-x^2}\le y\le\sqrt{9-x^2}\\ 0\le z\le\sqrt{9-x^2-y^2}\end{cases}$ $\Rightarrow z=\sqrt{9-x^2-y^2}$ 与 xoy 平面所围

设 $\cancel{x=\rho\cos\theta,\ y=\rho\sin\theta}$ $x=\rho\sin\varphi\cos\theta,\ y=\rho\sin\varphi\sin\theta,\ z=\rho\cos\varphi$

$\iiint\limits_\Omega z\sqrt{x^2+y^2+z^2}\,d\sigma=\int_0^{2\pi}d\theta\int_0^{\frac{\pi}{2}}\sin\varphi\cos\varphi\, d\varphi\int_0^3\rho^4d\rho$

$=\frac{243}{5}\pi.$