S.P. 2-H

A vector field is given by: $\mathbf{A} = \rho\cos^2\phi\,\hat{\mathbf{a}}_\rho - \rho\cos\phi\sin\phi\,\hat{\mathbf{a}}_\phi + z\hat{\mathbf{a}}_z$. Find the flux $\oint_S \mathbf{A} \cdot \mathbf{ds}$,

where S is the bounding surface of a cube over the range $0 \le x \le 2$, $0 \le y \le 2$, $0 \le z \le 2$

S.P. 2-I

Find the value of $\oint_S \mathbf{A}\,ds$, where $\mathbf{A} = \rho^2\,\hat{\mathbf{a}}_\rho + z^2\,\hat{\mathbf{a}}_z$, where S is the a cylinder of radius 2,

centered along the z axis, and extending from $z = 0$ to $z = 3$. Also, what is the average value of $\mathbf{A}$ on this surface?