Special Problem 2.4-13

Consider vector **A**, written in terms of orthonormal base vectors $\hat{a}_x, \hat{a}_y, \hat{a}_z$ as:

$$\mathbf{A} = 2\,\hat{a}_x + 4\,\hat{a}_z$$

We wish to express vector **A** in terms of a **new** set of orthonormal base vectors $\hat{i}, \hat{j}, \hat{k}$, i.e.:

$$\mathbf{A} = A_i\,\hat{i} + A_j\,\hat{j} + A_k\,\hat{k}$$

We know the following facts:

1. The **scalar projection** of vector **A** onto the direction $\hat{k}$ is equal to $-3\sqrt{2}$.

2. The **scalar component** of vector $\hat{i}$ in the direction $\hat{a}_x$ is equal to 0.5.

3. The **vector component** of $\hat{i}$ in the direction $\hat{a}_z$ is equal to $-0.5\,\hat{a}_z$.

4. The **angle** formed between vectors $\hat{j}$ and $\hat{a}_x$ is equal to 60°.

5. The **dot product** of vectors $\hat{j}$ and $\hat{a}_z$ is equal to -0.5.

Determine values A_i, A_j, and A_k.