Special Problem 2.4-13

Consider vector \( \mathbf{A} \), 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 \( \mathbf{A} \) 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 \( \mathbf{A} \) 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 \( A_k \).