DATA ENCRYPTION AND COMPRESSION

Question 1: Convert the Following Message to Binary:

- **Message**: "COMPUTER SCIENCE AND ENGINEERING"

You are tasked with encrypting a simple message using the **Caesar Cipher** technique, which shifts each letter of the plaintext by a fixed number of positions say 3, in the alphabet.

Question 2: VIGENERE CIPHER

The **Vigenère Cipher** is a method of encrypting alphabetic text by using a simple form of polyalphabetic substitution. It uses a keyword to shift letters in the plaintext.

Task:

1. **Encryption**:
   - **Keyword**: "KEY"
   - **Plaintext Message**: "ATTACK AT DAWN"
2. **Decryption**:
   - Using the same keyword, decrypt the message back to the original plaintext.

Question 3: Compressing and Decompressing Text Using Huffman Coding

Huffman Coding is a method of lossless data compression where characters are replaced by variable-length codes based on their frequencies in the text. More frequent characters use shorter codes, while less frequent characters use longer codes.

Task:

1. **Compression**:

   - **Input Text**: "BEEKEEPER"
   - Build a Huffman Tree, create the Huffman Codes, and compress the text using these codes.
2. **Decompression**:
   - Given the compressed text (encoded in Huffman codes) and the Huffman Tree, decompress it back to the original text.

Steps:

1. **Compression**:
   - **Frequency Analysis**: Count the frequency of each character in the text.
   - **Build Huffman Tree**: Create a binary tree where each leaf node represents a character and its frequency.
   - **Generate Huffman Codes**: Assign binary codes to characters based on the tree.
   - **Encode Text**: Replace each character in the text with its corresponding Huffman code.
2. **Decompression**:
   - **Decode Text**: Use the Huffman Tree to convert the Huffman codes back to the original characters.