

**Exercise 5 :**

Considering the fact an ASCII character requires 8 bits, it takes 8 bits for every character to be encoded, had we not used Huffman Coding. In this assignment, the input string was, "This is Lab 1!!". Thus, it would take  $8 \times 15 = 120$  bits. With Huffman Coding, the number bits required decreases to 49 bits for the compressed string (same example). This leads to almost a 60% reduction in the number of bits required to encode the sentence without any loss. One reason for this improvement is the fact that for each character, Huffman Coding significantly reduces the number of bits required. The codeword obtained for each character is very short since the most used characters have the smallest amount of bits and the least used characters have the greatest amount of bits without getting to 8 bits in general. Having a tree serves also to decrease the number of bits required.