**Programming Assignment 4: Huffman Code**

In this, you will construct *Huffman codes* based on the given frequencies of 26 English alphabets in upper case plus the space character (it is hard coded in the given asg4.java). You should design a HuffmanCode class and put it in the same directory of asg4.java.

* You will not randomly assign left and right children when merge two trees. Instead, you will build a *right-heavy* tree according to the following strategy. Also, if they are more than one tree with the same lowest or the second lowest frequency, use the same strategy to select.

1. The tree that is taller (i.e., the height is greater) will be the right child;
2. If the two trees are of the same height, then the tree with more nodes will be the right child;
3. If (1) and (2) fail to discriminate, then the sum of the ASCII values of the alphabets in the tree is greater will be the right child.

* You are not supposed to modify asg4.java. You will develop your own HuffmanCode with the following 4 required methods in program HuffmanCode.java.

1. HuffmanTree(char[] a, int[] f)
   1. This is a constructor that builds a Huffman tree based on a and f, where a is an array of characters to be encoded and f is an array of frequencies corresponding to the characters in a. For example, if a[3] = ’D’ and f[3] = 43, that means the frequency of ’D’ is 43.
2. public void printCodeWords()
   1. This method prints out all codewords in the Huffman tree from left leaves to right leaves in the tree. Use the following format:

Huffman Codes: E[69]:000 (127)

H[72]:0010 (61)

S[82]:0011 (63)

.....

Z[90]:1111111111 (1)

The 0-1 string indicates that 000 is the Huffman code for E, [69] indicates the ASCII value of character E, and (127) is the frequency; same to characters H, S and Z.

1. public String encode(String text)
   1. This method will return a 0-1 String using the Huffman codes. For example, encode("EHS") should return "00000100011"
2. public String decode(String codeString)
   1. The reverse of the function above. For example, decode("00000100011") returns "EHS".

You can have your own help methods in HuffmanCode.java. (HuffmanCode.java is the program where you define class HuffmanCode. By java’s requirement, the class name and the program name have to be same. You should not declare any package. The java compiler will automatically compile it as in the default package. I will use another program to test your HuffmanCode class.