

#### \*\*\*\* Explanation\_3\*\*\*\*

- The Huffman problem used class Node with attributes frequency, char, left, right.
- the implementation keep a dictionary of occurrence of each character.
- for key in dict(characters) the code uses min heap data structure to designated appropriate nodes to the characters.
- the root nodes are popped from the min heap and merged(add the freq and create new arbitrary node) till the length of heap is 1
- This 1 node object is a encoded tree.
- this data is then passed to the decoding function to decode the given data.

#### Methods used:

- > count\_occurrence(): Counts the frequency of keys and create a dictionary[key=char] and value = freq. Time complexity is  $O(n)$
- > create\_min\_heap(): give key and value create min heap by pushing the node in heap. Time complexity is  $O(\log n)$
- > merge\_low\_freq\_nodes(): Pops head and assign left and right node. Time complexity is  $O(1)$
- > code\_key(): assigns code to the character. since I look through all the node in tree Time complexity is  $O(n)$

#### Time Complexity:

The time complexity is  $O(n \log n)$

Time complexity for huffman\_encoding method —>  $n \log n$

Time complexity for huffman\_decoding method —>  $O(l)$  where  $l$  is the length of code.

#### Space complexity:

$O(\text{number of characters in the sentence})$