

VuID:

Problem Statement:

A competition of best quotes is being held in an educational institute. Administration of the institute will collect the quotes (messages) from students over the internet as a text file. A task assigned to you is to use the Huffman encoding technique and build a binary tree that will be used to encode and decode the content of text files. Consider the message given below that is saved in text files and received through the internet. You have to build a frequency table and Huffman encoding binary tree. Furthermore, calculate the efficiency of this encoding technique and calculate how much bandwidth is saved for compressing the files/messages of 10,000 students.

Text Message:

Education is one thing no one can take away from you

SOLUTION:

1. Count all the letters including space from the given text message.

PART 1

Total 52 characters including space from the given text

2. Draw a table with column names (letter, frequency, original bits, encoded bits)
3. Fill the table with letters, frequency, original bits (for original bits get ASCII decimal code of each letter, convert the decimal ASCII into 8 bits binary code) and encoded bits (these can be found from Huffman encoding tree as mentioned in point 5).

PART 2 and PART 3

Table with column names (letter, frequency, original bits, encoded bits) and Fill the table with letters, frequency, original

Letter	Frequency	Orginal Bits	Encoded Bits
Space	10	00100000	01
n	6	01101110	000
o	6	01101111	001
a	5	01100001	1010
e	4	01100101	1100

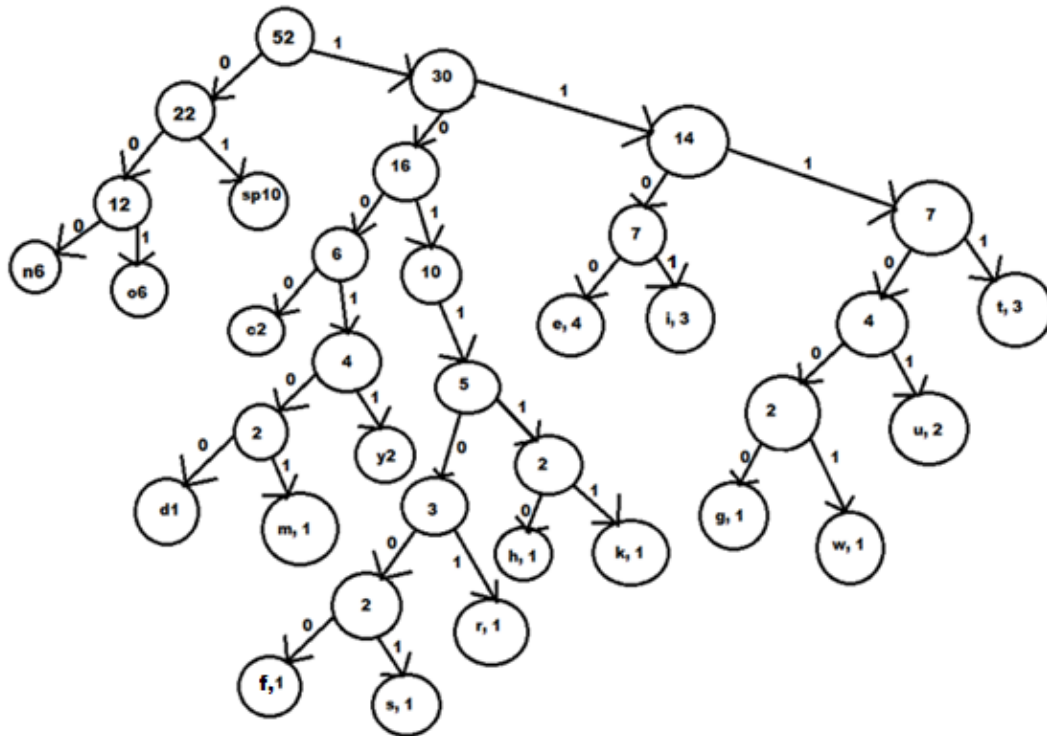
t	3	01110100	1111
i	3	01101001	1101
u	2	01110101	11101
c	2	01100011	1000
y	2	01111001	10011
d	1	01100100	100100
s	1	01110011	1011001
h	1	01101000	101110
g	1	01100111	111000
k	1	01101011	101111
w	1	01110111	111001
f	1	01100110	1011000
r	1	01110010	101101
m	1	01101101	100101

4. Draw final Huffman encoding tree with the help of frequency table. (Step by step construction of Huffman encoding tree is not required, just show the final tree in the solution file).
5. Get the encoded bits from tree and fill code of each letter in last column of table constructed in step 2.

SOLUTION

PART 4 and PART 6

Huffman encoding Tree with code



6. Calculate the efficiency of Huffman encoding technique.
(For efficiency use total original bits, total compressed (encoded) bits and find what percentage of memory is saved with the help of Huffman encoding technique).

Entire 93 bits are required using the Huffman encoding method. Whereas if we send the unique message the total characters are 52 each bit requires 8 bits. So the tangible message will require $52 \times 8 = 416$ bits. This digit of bits is 77% less than the number of bits in the ASCII encoding form.

7. For the calculation of bandwidth saved for 10,000 messages, use the calculation performed in step 6.

For message of 10,000 students we can just use 33% of entirety bandwidth and can keep 77% bandwidth. For 10,000 messages simply 3300 messages bandwidth will be compulsory

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