Quiz 5

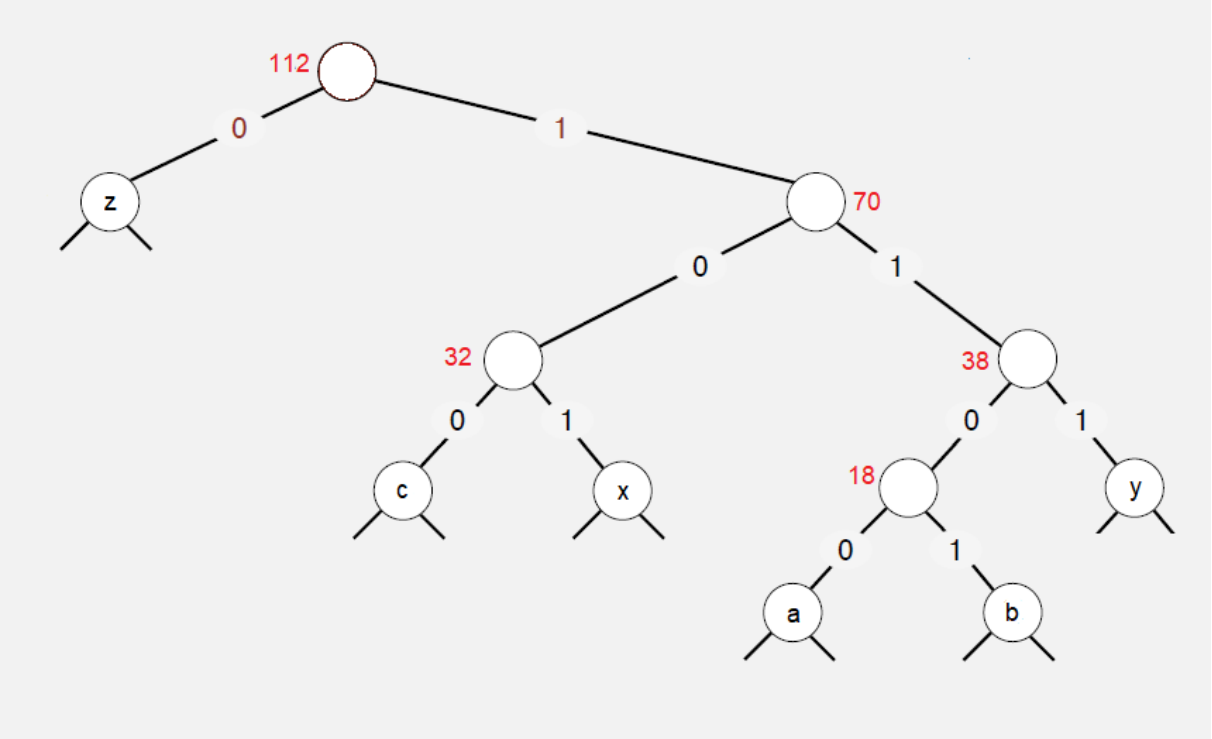
İbrahim Burak Tanrıkulu **21827852**

Q1

Creating tree:

- a and b have minimum frequency. Merge into a tree with 7+11 = 18 frequency.
- c and x have minimum frequency. Merge into a tree with 14+18 = 32 frequency.
- a-b tree and y have minimum frequency. Merge into a tree with 18+20 = 38 frequency.
- c-x tree and (a-b)-y tree have minimum frequency. Merge into a tree with 32+38 = 70 frequency.
- z and (c-x)-((a-b)-y) tree have minimum frequency. Merge into a tree with 42+70 = 112 frequency.

We created our tree as below:



From the tree, we encoded our variables to these values:
z = 0
c = 100
x = 101
y = 111
a = 1100
b = 1101

Number of bits: 112*16 = 1792
Number of bits with new transmission:
4*7 + 4*11 + 3*14 + 3*18 + 3*20 + 1*42 = 28+44+42+54+60+42 = 270
We saved 1522 bit.

Q2

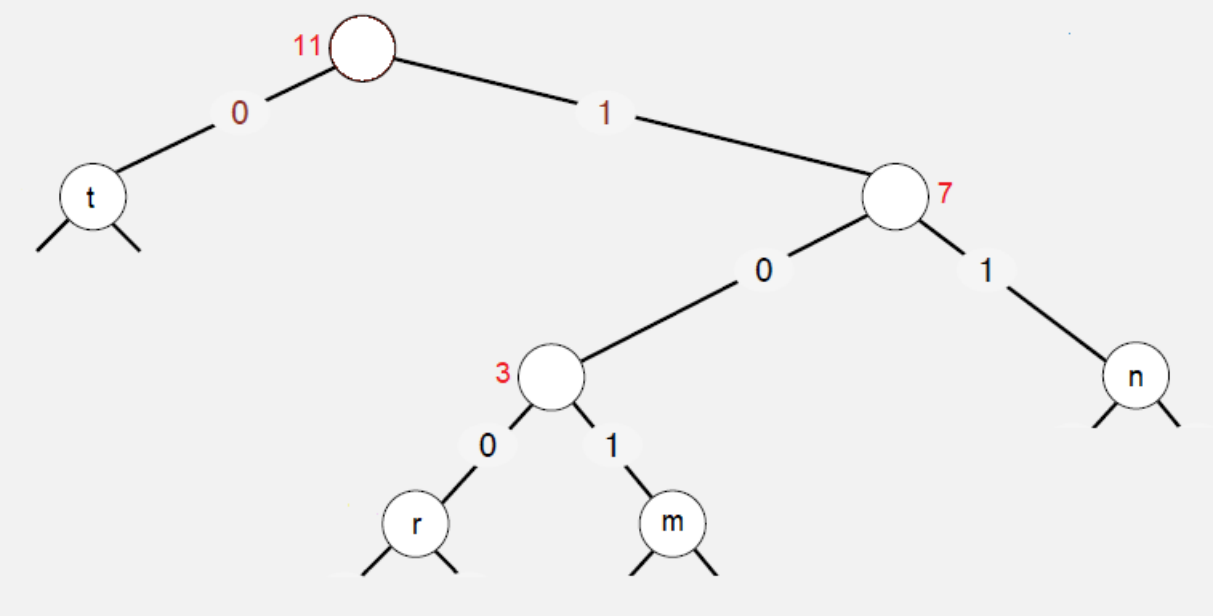
Our string: “rmmnnnnttttt”

Frequencies:
r = 1 m = 2 n = 4 t = 4

Creating tree:

- r and m have minimum frequency. Merge into a tree with 1+2 = 3 frequency.
- r-m tree and n have minimum frequency. Merge into a tree with 3+4 = 7 frequency.
- (r-m)-n tree and t have minimum frequency. Merge into a tree with 7+4 = 11 frequency.

We created our tree as below:



From the tree, we encoded our variables to these values:
t = 0
n = 11
r = 100
m = 101

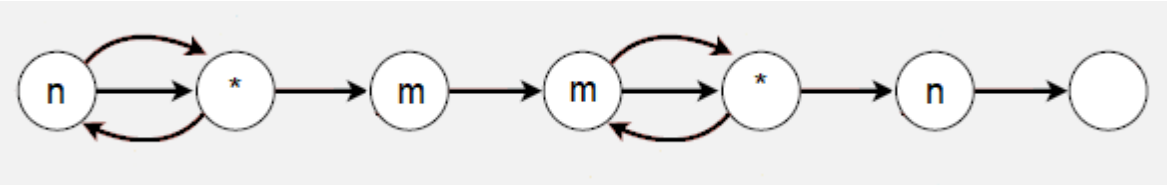
We need 1*3 + 2*3 + 4*2 + 4*1 = 3+6+8+4 = **21** bits to transmit this massage via Huffman encoding.

100 101 101 11 11 11 11 0 0 0 0
r m m n n n n t t t t

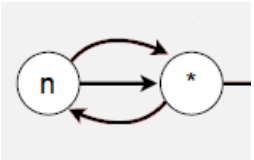
Average bits per character is (1+2+3+3)/4 = 9/4 = **2,25** .

Q3

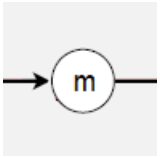
Regular expression: “n*m+n” or “n*mm*n”



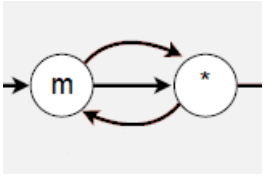
- Firstly, traverse “n” letters if exists.



- Secondly, get first “m” letter.



- Thirdly, traverse “m” letters if exist.



- Finally, get last “n” letter. Thus we found our “mn” substing.