Encryption Assignment

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To decrypt the given text I followed some steps .These are –

- First I count how many times a letter has appeared in the text by using coding.In coding part I use mapping to count the letter.
- The code is given bellow

```cpp
#include<bits/stdc++.h>
using namespace std;
map<char,int>m;
int main()
{
  map<char,int>::iterator it;
  char s;
  while(cin>>s,s!='$')
  {
    m[s]++;
  }
  for(it=m.begin();it!=m.end();it++)
  {
   cout << it->first << " " << it->second << endl;
  }
  return 0;
```

}

- Secondly,I use frequency table to guess which letter has replaced by which one :

Encrypted letter number	Frequency Table
U 198	E 12.22%
K 132	T 9.67%
O 131	A 8.05%
H 113	O 7.63%
C 102	N 6.95%
L 97	H 6.62%
M 95	I 6.28%
Z 95	S 6.02%
V 85	R 5.92%
J 74	D 5.10%
E 71	L 4.08%
A 47	U 2.92%
Q 42	W 2.60%
S 38	M 2.33%
W 38	G 2.30%
N 37	C 2.23%
T 34	F 2.14%
D 29	Y 2.04%
G 28	B 1.67%
Y 28	P 1.66%
P 28	K 0.95%
R 7	V 0.82%
B 5	J 0.19%
	X 0.11%

- By the coding part I get most used letters in text. Then I compared with the frequency table and replace most used encrypt letters with the maximum frequency.I replaced first six letters because after six letters the frequency is closest.So I changed first six letters.Such as

  1. U is replace by E
  2. K is replace by T
  3. O is replace by A
  4. H is replace by O
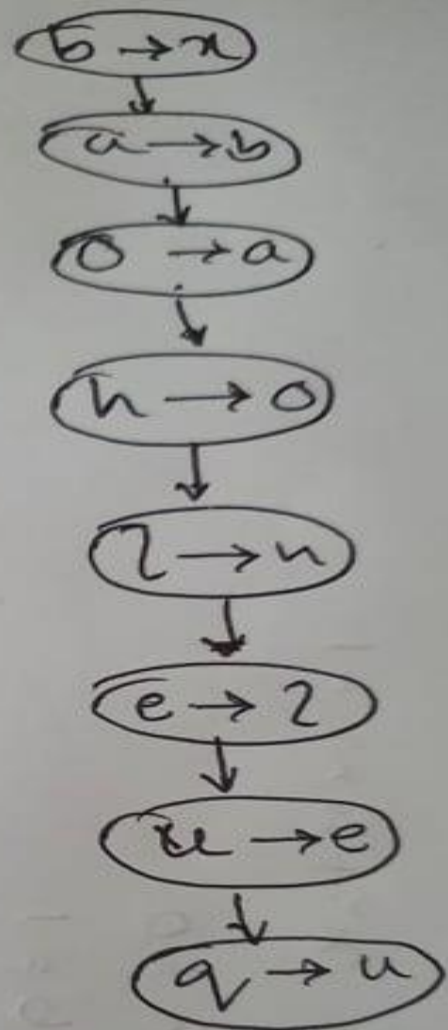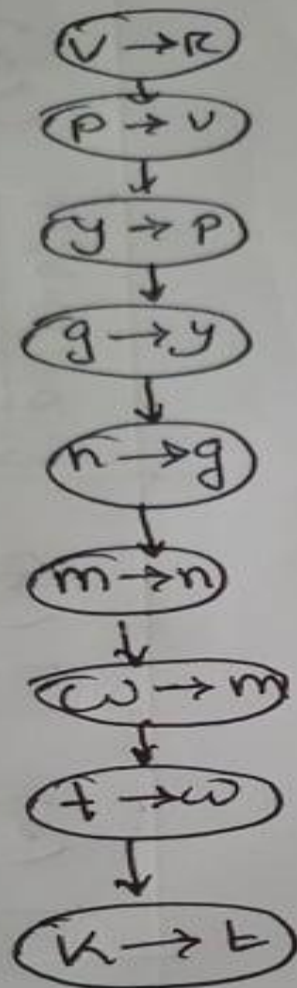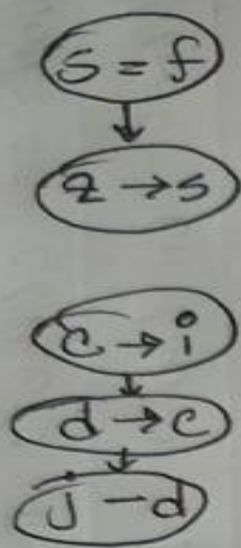 5. C is replace by N
  6. L is replace by H
- After replacing first six letters we started guessing such as thnvtg-thvee this word assume thirty three. So I again replaced some letters such as
  n->i
  v->r
  g->y

this assumption can be worng .So we have to check again and again to get the right word.Since 1st step I replaced C by N and then I replaced N by I.So I understood that 1st assumption was worng. In this way I assumed again and again and also iterated again and again .The I found a final tree structer.The tree structer is given   bellow

Column 1:

$$s = f$$
$$z \rightarrow s$$

$$c \rightarrow i$$
$$d \rightarrow c$$
$$j \rightarrow d$$

Column 2:

$$v \rightarrow R$$
$$p \rightarrow v$$
$$y \rightarrow p$$
$$g \rightarrow y$$
$$n \rightarrow g$$
$$m \rightarrow n$$
$$\omega \rightarrow m$$
$$t \rightarrow \omega$$
$$k \rightarrow t$$

Column 3:

$$b \rightarrow x$$
$$a \rightarrow b$$
$$o \rightarrow a$$
$$h \rightarrow o$$
$$2 \rightarrow u$$
$$e \rightarrow 2$$
$$u \rightarrow e$$
$$q \rightarrow u$$

- After replacing all letters I found the text that is given bellow

bilbo tas very rich and very peculiar, and had been the tonder of the shire for sixty years, ever since his remarrable disappearance and unexpected return. the riches he had brought bacr from his travels had not become a local legend, and it tas popularly believed, thatever the old folr might say, that the hill at bag end tas full of tunnels stuffed tith treasure. and if that tas not enough for fame, there tas also his prolonged vigour to marvel at. time tore on, but it seemed to have little effect on mr. baggins. at ninety he tas much the same as at fifty. at ninety-nine they began to call him tell-preserved; but unchanged tould have been nearer the marr. there tere some that shoor their heads and thought this tas too much of a good thing; it seemed unfair that anyone should possess (apparently) perpetual youth as tell as (reputedly) inexhaustible tealth. it till have to be paid for, they said. it isn't natural, and trouble till come of it! but so far trouble had not come; and as mr. baggins tas generous tith his money, most people tere tilling to forgive him his oddities and his good fortune. he remained on visiting terms tith his relatives (except, of course, the sacrvillebagginses), and he had many devoted admirers among the hobbits of poor and unimportant families. but he had no close friends, until some of his younger cousins began to grot up. the eldest of these, and bilbo's favourite, tas young frodo baggins. then bilbo tas ninety-nine he adopted frodo as his heir, and brought him to live at bag end; and the hopes of the sacrville-bagginses tere finally dashed. bilbo and frodo happened to have the same birthday, september 22nd. you had better come and live here, frodo my lad, said bilbo one day; and then te can celebrate our birthday-parties comfortably together. at that time frodo tas still in his tteens, as the hobbits called the irresponsible ttenties betteen childhood and coming of age at thirty-three

- Even after changing the text with the assumptions we had there are still some word remain that are misspelled.Such as tonder, tas, thatever, ttenties, betteen etc.So I have to change this manually and then to get right word I have to replace t by w.By replacing I get the final decrypted text and the text is given bellow

Decrypted Text :

bilbo was very rich and very peculiar, and had been the wonder of the shire for sixty years, ever since his remarkable disappearance and unexpected return. the riches he had brought back from his travels had now become a local legend, and it was popularly believed, whatever the old folk might say, that the hill at bag end was full of tunnels stuffed with treasure. and if that was not enough for fame, there was also his prolonged vigour to marvel at. time wore on, but it seemed to have little effect on mr. baggins. at ninety he was much the same as at fifty. at ninety-nine they began to call him well-vreserved; but unchanged would have been nearer the mark. there were some that shook their heads and thought this was too much of a good thing; it seemed unfair that anyone should possess (apparently) pervetual youth as well as (revutedly) inexhaustible wealth. it will have to be vaid for, they said. it isn't natural, and trouble will come of it! but so far trouble had not come; and as mr. baggins was generous with his money, most veovle were willing to forgive him his oddities and his good fortune. he remained on visiting terms with his relatives (excevt, of course, the sackvillebagginses), and he had many devoted admirers among the hobbits of poor and unimportant families. but he had no close friends, until some of his younger cousins began to grow up. the eldest of these, and bilbo's

favourite, was young frodo baggins. when bilbo was ninety-nine he adopted frodo as his heir, and brought him to live at bag end; and the hopes of the sackville- bagginses were finally dashed. bilbo and frodo happened to have the same birthday, september 22nd. you had better come and live here, frodo my lad, said bilbo one day; and then we can celebrate our birthday-parties comfortably together. at that time frodo was still in his tweens, as the hobbits called the irresponsible twenties between childhood and coming of age at thirty-three