LAB 9

Randomly generate a string of length 100 with the following alphabet set {a, b, c, d). Write a program to use Huffman codes to compress the string.

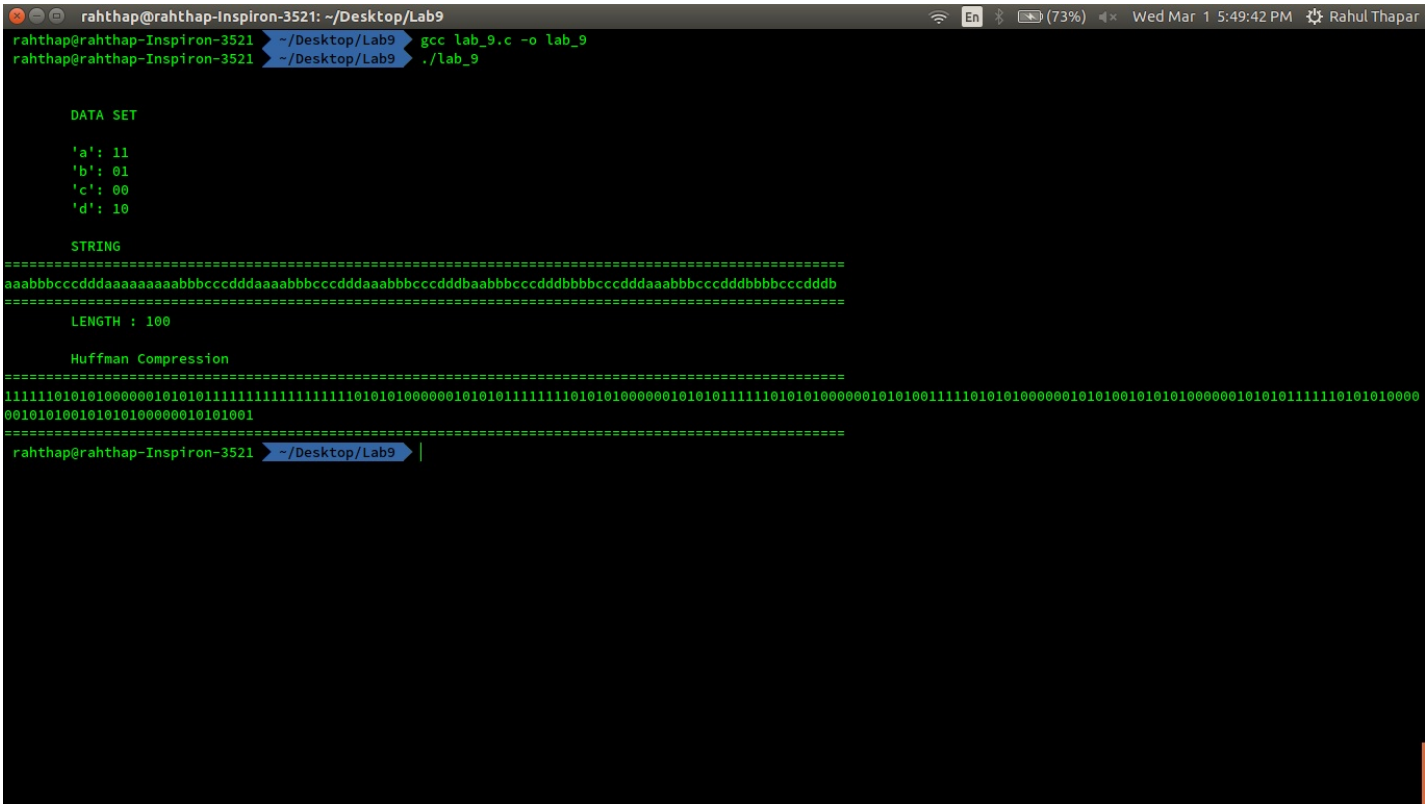
Name : RAHUL THAPAR
ID : 1410110321
Date **of** Submission : 1 March, 2017

CODE

```
/*
   @author :Rahul Thapar
   ID  : 1410110321

   Randomly generate a string of length 100 with the following alphabet set {a, b, c, d).
   Write a program to use Huffman codes to compress the string.
*/
#include <stdio.h>
#include <string.h>

typedef struct node_t {
   struct node_t *left, *right;
   int frequency;
   char c;
} *node;


node new_node(int frequency, char c, node a, node b)
{
   node n = pool + n_nodes++;
   if (frequency) n->c = c, n->frequency = frequency;
   else {
      n->left = a, n->right = b;
      n->frequency = a->frequency + b->frequency;
   }
   return n;
}

/* priority queue */
void insert(node n)
{
   int j, i = end++;
   while ((j = i / 2)) {
      if (q[j]->frequency <= n->frequency)
         break;
      q[i] = q[j], i = j;
   }
   q[i] = n;
}

node qremove()
{
   int i, l;
   node n = q[i = 1];

   if (end < 2)
      return 0;
   end--;
   while ((l = i * 2) < end) {
      if (l + 1 < end && q[l + 1]->frequency < q[l]->frequency) l++;
      q[i] = q[l], i = l;
   }
```

```
    q[i] = q[end];
    return n;
}

/* walk the tree and put 0s and 1s */
void build_code(node n, char *s, int len)
{
    static char *out = buffer;
    if (n->c) {
        s[len] = 0;
        strcpy(out, s);
        code[n->c] = out;
        out += len + 1;
        return;
    }

    s[len] = '0'; build_code(n->left,  s, len + 1);
    s[len] = '1'; build_code(n->right, s, len + 1);
}


void encode(const char *s, char *out)
{
    while (*s) {
        strcpy(out, code[*s]);
        out += strlen(code[*s++]);
    }
}


int main(void)
{

    int i;
    const char *str = "aaabbbcccdddaaaaaaaaabbbcccdddaaaabbbcccdddaaabbbcccdddbaabbbcccdddbbbbcccdddaaabbbcccdddbbbbcccdddb";
        char buffer[1024];

    init(str);
    printf("\n\n");
    printf("\tDATA SET\n\n");
    for (i = 0; i < 128; i++)
        if (code[i])
            printf("\t'%c': %s\n", i, code[i]);

    int len = strlen(str);
    printf("\n\tSTRING \n==========================================================================================");
    printf("\tLENGTH : %d\n",len );
    encode(str, buffer);
    printf("\n\tHuffman Compression \n==========================================================================");

    return 0;
}
```

Screenshots


rahthap@rahthap-Inspiron-3521: ~/Desktop/Lab9
(73%) Wed Mar 1 5:49:42 PM Rahul Thapar
rahthap@rahthap-Inspiron-3521 ~/Desktop/Lab9 gcc lab_9.c -o lab_9
rahthap@rahthap-Inspiron-3521 ~/Desktop/Lab9 ./lab_9
DATA SET
'a': 11
'b': 01
'c': 00
'd': 10
STRING
aaabbbccdddaaaaaaaabbbccdddaaaabbbccdddaaabbbccdddbaabbbccdddbbbbccdddaaabbbccdddbbbbccdddb
LENGTH : 100
Huffman Compression
1111110101010000001010101111111111111111101010100000010101011111111010101000000101010111111010101000000101010011111010101000000101010111111010101000000101010111111010100000010101001
rahthap@rahthap-Inspiron-3521 ~/Desktop/Lab9