PRACTICAL NO : 9

HASH TABLE IMPLEMENTAION

AIM : Implement a hash table data structure using different hash function and collision resolution techniques such as chaining and open addressing.

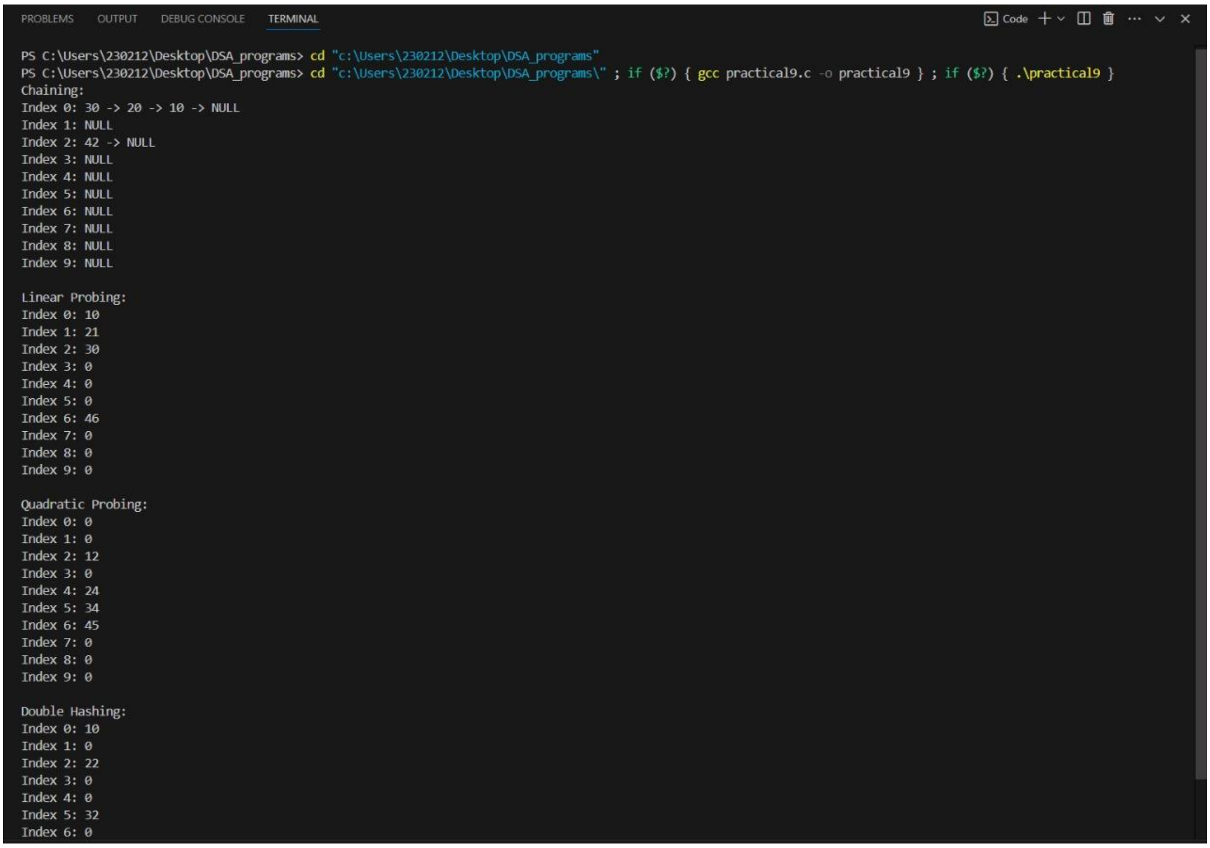
PROGRAM :

```
#include <stdio.h>
#include <stdlib.h>

#define SIZE 10

// Node for chaining
struct Node {
   int data;
   struct Node* next;
};

struct Node* chainTable[SIZE]; // Hash table for chaining
int openAddressingTable[SIZE];  // Hash table for open addressing

// Hash function
int hashFunction(int value) {
   return value % SIZE;
}

// Chaining
void insertChaining(int value) {
   int index = hashFunction(value);
```

```
  struct Node* newNode = (struct Node*)malloc(sizeof(struct Node));
  newNode->data = value;
  newNode->next = chainTable[index];
  chainTable[index] = newNode;
}

void displayChaining() {
  for (int I = 0; I < SIZE; i++) {
    struct Node* temp = chainTable[i];
    printf(“Index %d: “, i);
    while (temp) {
      printf(“%d -> “, temp->data);
      temp = temp->next;
    }
    printf(“NULL\n”);
  }
}

// Linear Probing
void insertLinearProbing(int value) {
  int index = hashFunction(value);
  while (openAddressingTable[index] != 0) {
    index = (index + 1) % SIZE;
  }
  openAddressingTable[index] = value;
}

void displayLinearProbing() {
  for (int I = 0; I < SIZE; i++) {
    printf(“Index %d: %d\n”, I, openAddressingTable[i]);
  }
}

// Quadratic Probing
void insertQuadraticProbing(int value) {
  int index = hashFunction(value);
  for (int I = 0; I < SIZE; i++) {
    int newIndex = (index + I * i) % SIZE;
    if (openAddressingTable[newIndex] == 0) {
      openAddressingTable[newIndex] = value;
      return;
    }
  }
}

// Double Hashing
int secondHashFunction(int value) {
  return 7 – (value % 7); // Secondary hash function
}

void insertDoubleHashing(int value) {
  int index = hashFunction(value);
  int stepSize = secondHashFunction(value);
  while (openAddressingTable[index] != 0) {
    index = (index + stepSize) % SIZE;
  }
  openAddressingTable[index] = value;
}

// Main function
int main() {
  // Chaining
  printf(“Chaining:\n”);
  insertChaining(10);
  insertChaining(20);
  insertChaining(30);
  insertChaining(42);
  displayChaining();

  // Open Addressing
  printf(“\nLinear Probing:\n”);
  for (int I = 0; I < SIZE; i++) {
    openAddressingTable[i] = 0; // Initialize the table
  }
  insertLinearProbing(10);
  insertLinearProbing(21);
  insertLinearProbing(30);
  insertLinearProbing(46);
  displayLinearProbing();

  // Quadratic Probing
  printf(“\nQuadratic Probing:\n”);
  for (int I = 0; I < SIZE; i++) {
    openAddressingTable[i] = 0; // Initialize the table
  }
  insertQuadraticProbing(12);
  insertQuadraticProbing(24);
  insertQuadraticProbing(34);
  insertQuadraticProbing(45);
  displayLinearProbing(); // Reusing display function

  // Double Hashing
  printf("\nDouble Hashing:\n");
  for (int I = 0; I < SIZE; i++) {
    openAddressingTable[i] = 0; // Initialize the table
  }
  insertDoubleHashing(10);
  insertDoubleHashing(22);
  insertDoubleHashing(32);
  insertDoubleHashing(45);
  displayLinearProbing(); // Reusing display function

  return 0;
}
```

OUTPUT

PRACTICAL NO : 9



```
PS C:\Users\230212\Desktop\DSA_programs> cd "c:\Users\230212\Desktop\DSA_programs"
PS C:\Users\230212\Desktop\DSA_programs> cd "c:\Users\230212\Desktop\DSA_programs\" ; if ($?) { gcc practical9.c -o practical9 } ; if ($?) { .\practical9 }
Chaining:
Index 0: 30 -> 20 -> 10 -> NULL
Index 1: NULL
Index 2: 42 -> NULL
Index 3: NULL
Index 4: NULL
Index 5: NULL
Index 6: NULL
Index 7: NULL
Index 8: NULL
Index 9: NULL

Linear Probing:
Index 0: 10
Index 1: 21
Index 2: 30
Index 3: 0
Index 4: 0
Index 5: 0
Index 6: 46
Index 7: 0
Index 8: 0
Index 9: 0

Quadratic Probing:
Index 0: 0
Index 1: 0
Index 2: 12
Index 3: 0
Index 4: 24
Index 5: 34
Index 6: 45
Index 7: 0
Index 8: 0
Index 9: 0

Double Hashing:
Index 0: 10
Index 1: 0
Index 2: 22
Index 3: 0
Index 4: 0
Index 5: 32
Index 6: 0
```

GITHUB LINK : https://github.com/AmolNagargoje04/Data-Structure-practical