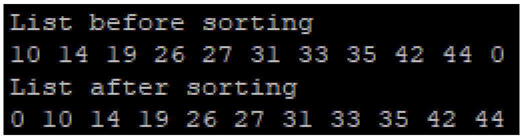
EX NO16 IMPLEMENTATION OF COLLISION RESOLUTION TECHNIQUE

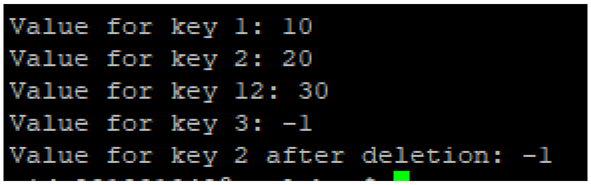
```
#include <stdio.h>
#include <stdlib.h>
#include <stdbool.h>

#define SIZE 10 // Size of the hash table

// Structure to represent a node in the hash table
struct Node {
    int key;
    int value;
};

// Structure to represent the hash table
struct HashTable {
    struct Node* array[SIZE];
};

// Function to create a new node
struct Node* createNode(int key, int value) {
    struct Node* newNode = (struct Node*)malloc(sizeof(struct Node));
    newNode->key = key;
    newNode->value = value;
    return newNode;
}

// Function to create a hash table
struct HashTable* createHashTable() {
    struct HashTable* hashTable = (struct HashTable*)malloc(sizeof(struct HashTable));
    for (int i = 0; i < SIZE; i++) {
        hashTable->array[i] = NULL;
    }
    return hashTable;
}

// Function to calculate the hash index
int hash(int key) {
    return key % SIZE;
}

// Function to perform open addressing (linear probing) for collision resolution
void linearProbing(struct HashTable* hashTable, int key, int value) {
    int index = hash(key);
    while (hashTable->array[index] != NULL) {
        index = (index + 1) % SIZE; // Linear probing
    }
    hashTable->array[index] = createNode(key, value);
}

// Function to perform closed addressing (chaining) for collision resolution
void chaining(struct HashTable* hashTable, int key, int value) {
    int index = hash(key);
    struct Node* newNode = createNode(key, value);
    if (hashTable->array[index] == NULL) {
        hashTable->array[index] = newNode;
    } else {
        // Adding to the end of the linked list at the index
        struct Node* temp = hashTable->array[index];
        while (temp->next != NULL) {
            temp = temp->next;
        }
        temp->next = newNode;
    }
}

// Function to display the hash table
void display(struct HashTable* hashTable) {
    for (int i = 0; i < SIZE; i++) {
        printf("%d: ", i);
        struct Node* temp = hashTable->array[i];
        while (temp != NULL) {
            printf("(%d, %d) ", temp->key, temp->value);
            temp = temp->next;
        }
        printf("\n");
    }
}

int main() {
    struct HashTable* hashTable_linear = createHashTable();
    struct HashTable* hashTable_chaining = createHashTable();

    // Inserting elements using linear probing
    linearProbing(hashTable_linear, 10, 20);
    linearProbing(hashTable_linear, 21, 30);
    linearProbing(hashTable_linear, 22, 40);
    linearProbing(hashTable_linear, 23, 50);
    linearProbing(hashTable_linear, 33, 60);

    // Inserting elements using chaining
    chaining(hashTable_chaining, 10, 20);
    chaining(hashTable_chaining, 21, 30);
    chaining(hashTable_chaining, 22, 40);
    chaining(hashTable_chaining, 23, 50);
    chaining(hashTable_chaining, 33, 60);

    printf("Hash Table with Linear Probing:\n");
    display(hashTable_linear);

    printf("\nHash Table with Chaining:\n");
    display(hashTable_chaining);

    return 0;
}
```

OUTPUT:



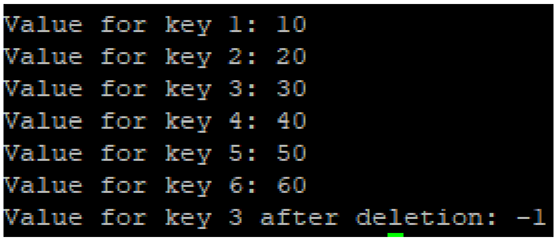
```
List before sorting
10 14 19 26 27 31 33 35 42 44 0
List after sorting
0 10 14 19 26 27 31 33 35 42 44
```

OUTPUT 2:



```
Value for key 1: 10
Value for key 2: 20
Value for key 12: 30
Value for key 3: -1
Value for key 2 after deletion: -1
```

OUTPUT 3:



```
Value for key 1: 10
Value for key 2: 20
Value for key 3: 30
Value for key 4: 40
Value for key 5: 50
Value for key 6: 60
Value for key 3 after deletion: -1
```