G. H. RAISONI COLLEGE OF ENGG., NAGPUR

(An Autonomous Institute under UGC Act 1956)

Department of Artificial Intelligence

Date: 05/08/2020

Practical Subject: Data Structures and Algorithms
Session: 2020-21

Student Details:

Roll Number	63
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Semester	3
Section	A
Branch	Artificial Intelligence

Practical Details: Practical Number- 4

Practical Aim	Design, develop and implement a program in C that uses functions to perform the following: a) Create a singly linked list of integers. b) Delete a given integer from the above linked list. c) Display the contents of the above list after deletion.
Theory	A linked list is a linear data structure where each element is a separate object. Linked list elements are not stored at contiguous location; the elements are linked using pointers. Each node of a list is made up of two items - the data and a reference to the next node. The last node has a reference to null. The entry point into a linked list is called the head of the list. ***Insertion:*** Adds an element at the beginning of the list. The new node is always added before the head of the given Linked List. And newly added node becomes the new head of the Linked List. ***Delete:*** Deletes an element using the given key. ***Display:*** Displays the complete list.

Procedure	1. START 2. Ask user for list size 3. Insert elements in Linked List from head 4. Display Linked List 5. Ask user for deleting an element 6. Find and delete the node 7. Display new Linked List 8. STOP
Algorithm	Step 1: START Step 2: Ask user for list size n and initialize i = 0 Step 3: Start with an empty list; point head to NULL Step 4: Enter an element var and pass it to push function Step 5: Allocate and put data in node Step 6: Make next of new node as head Step 7: Move the head to point to the new node Step 8: Increment I by 1 Step 9: While i < size of list n, go to Step 4 else go to Step 10 Step 10: Display the list Step 11: Ask user for deleting an element var Step 12: Call deleteNode function with var Step 13: Find previous node of the node to be deleted Step 14: Change the next of previous node Step 15: Free memory for the node to be deleted Step 16: Display New Linked List Step 17: STOP
Program	

```c
void push(struct Node** head_ref, int new_data)
{
    struct Node* new_node = (struct Node*) malloc(sizeof(struct Node));
    new_node->data = new_data;
    new_node->next = (*head_ref);
    (*head_ref) = new_node;
}

void deleteNode(struct Node **head_ref, int key)
{
    struct Node* temp = *head_ref, *prev;
    if (temp != NULL && temp->data == key)
    {
        *head_ref = temp->next;
        free(temp);
        return;
    }
    while (temp != NULL && temp->data != key)
    {
        prev = temp;
        temp = temp->next;
    }
    if (temp == NULL) return;
    prev->next = temp->next;

    free(temp);
}

void printList(struct Node *node)
{
    while (node != NULL)
    {
        printf(" %d ", node->data);
        node = node->next;
    }
}

int main()
{
    struct Node* head = NULL;
    int var, n, i;
    printf("\n Program Author: Vishal Narnaware");
    printf("\n Branch: Artificial Intelligence Engineering");
    printf("\n Section: A \t Semester: III");
    printf("\n Roll Number: 63");
    printf("\n Enter size of list: ");
    scanf("%d", &n);
    for(i=0; i<n; i++)  {
        printf(" Enter element %d: ", i+1);
        scanf("%d", &var);
        push(&head, var);
    }

```

```c
    printf(" Created Linked List: ");
    printList(head);
    printf("\n Enter element to be deleted: ");
    scanf("%d", &var);
    deleteNode(&head, var);
    printf("\n Linked List after Deletion of %d: ", var);
    printList(head);
    return 0;
}
```

Output

```
C:\Users\bagde\Desktop\Vishal\C\C-Basics\Practical\Practical4>out.exe

 Program Author: Vishal Narnaware
 Branch: Artificial Intelligence Engineering
 Section: A      Semester: III
 Roll Number: 63
 Enter size of list: 7
 Enter element 1: 3
 Enter element 2: 8
 Enter element 3: 3
 Enter element 4: 2
 Enter element 5: 10
 Enter element 6: 9
 Enter element 7: 5
 Created Linked List:  5  9  10  2  3  8  3
 Enter element to be deleted: 10

 Linked List after Deletion of 10:  5  9  2  3  8  3
```

Conclusion

Hence, successfully designed and developed a program to create a Linked List and performed basic operations – insertion, delete and display on it.