Symbiosis Institute of Technology

Faculty of Engineering

CSE- Academic Year 2024-25

Data Structures – Lab Batch 2023-27

Lab Assignment No:- 5	
Name of Student	Pankhuri Varshney
PRN No.	23070122160
Batch	2023-27
Class	CS-B2
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Title of Assignment:	Menu-driven program for: 1. Creation of One-Way Linked list 2. Insertion at beginning 3. Insertion at end 4. Insertion after specific node 5. Display
Source Code/Algorithm/Flow Chart:	**Implement a menu-driven program to:** **1. Create a one-way linked list** **2. Insert a node at the beginning** **3. Insert a node at the end** **4. Insert a node at a specific index** **5. Display the linked list** **SOURCE CODE:** #include <stdio.h> #include <stdlib.h>

```
struct node {
   int a;
   struct node* ptr;
};

void insertBegin(struct node **head, int val);
void insertEnd(struct node **head, int nextData);
void insertAfterNode(struct node **head, int val, int after);
void printList(struct node* head);

void insertBegin(struct node **head, int val){
   struct node *newNode=(struct node*)malloc(sizeof(struct node*));
   newNode->a=val;
   newNode->ptr=NULL;
   if(*head==NULL){
      *head=newNode;
   }
   else{
      newNode->ptr=*head;
      *head=newNode;
   }
}
void insertEnd(struct node **head, int nextData){
   struct node *newNode=(struct node*)malloc(sizeof(struct node));
   newNode->a=nextData;
   newNode->ptr=NULL;

   if(*head==NULL){
      *head=newNode;
   }
   else{
      struct node *temp=*head;
      while(temp->ptr!=NULL){
         temp=temp->ptr;
      }
      temp->ptr=newNode;
   }
}
void insertAfterNode(struct node **head, int val, int after){
   struct node *newNode=(struct node*)malloc(sizeof(struct node*));
   newNode->a=val;
   if(*head==NULL){
      printf("INVALID! LIST IS EMPTY\n");
   }
   else{
      struct node *temp=*head;
      while(temp->ptr!=NULL && temp->a!=after){
         temp=temp->ptr;
      }
      if(temp->a==after){
```

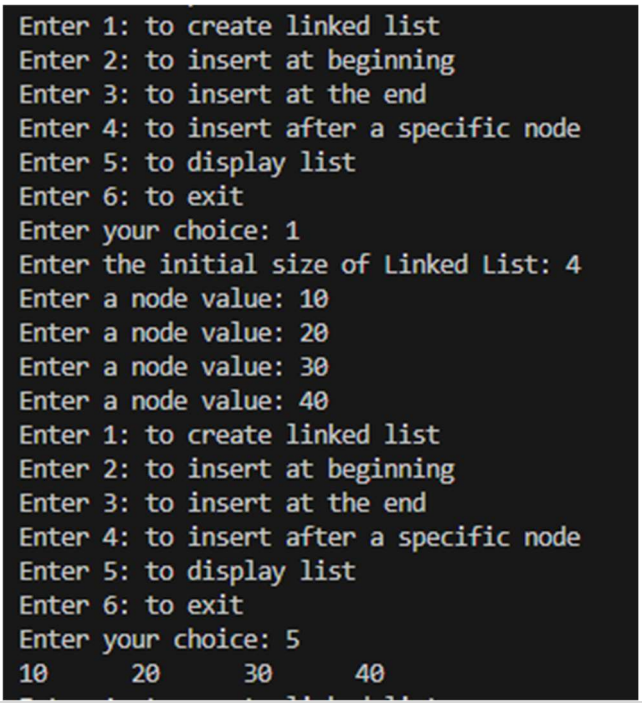
```
            newNode->ptr=temp->ptr;
            temp->ptr=newNode;
        }
        else{
            printf("INVALID OPERATION! INDEX OUT OF BOUND\n");
        }
    }
}
void printList(struct node* head){
    struct node *temp=head;
    if(head==NULL)
        printf("LINKED LIST EMPTY\n");
    int i=1;
    while(temp!=NULL){
        printf("%d\t",temp->a);
        temp=temp->ptr;
    }
    printf("\n");
}

int main(){
    struct node *head=NULL;
    while(1){
        printf("Enter 1: to create linked list\nEnter 2: to insert at
beginning\nEnter 3: to insert at the end\nEnter 4: to insert after a specific
node\nEnter 5: to display list\nEnter 6: to exit\nEnter your choice: ");
        int ch;
        scanf("%d", &ch);
        switch(ch){
            case 1:{
                printf("Enter the initial size of Linked List: ");
                int size;
                scanf("%d", &size);
                for(int i=0; i<size; i++){
                    printf("Enter a node value: ");
                    int val;
                    scanf("%d", &val);
                    insertEnd(&head, val);
                }
                break;
            }
            case 2:{
                printf("Enter a number: ");
                int num;
                scanf("%d", &num);
                insertBegin(&head, num);
                break;
            }
            case 3:{
                printf("Enter a number: ");
                int num;
```

```
            scanf("%d", &num);
            insertEnd(&head, num);
            break;
        }
        case 4:{
            printf("Enter a number: ");
            int num, index;
            scanf("%d", &num);
            printf("Enter a node after which the number will be added: ");
            scanf("%d", &index);
            insertAfterNode(&head, num, index);
            break;
        }
        case 5:{
            printList(head);
            break;
        }
        case 6:{
            goto end;
        }
        default:
        printf("INVALID CHOICE\n");
      }
   }
   end: printf("\n");
   return 0;
}
```

Output Screenshots

1. CREATION OF LINKED LIST AND DISPLAY:



2. INSERTION AT BEGINNING AND DISPLAY:

```
Enter 1: to create linked list
Enter 2: to insert at beginning
Enter 3: to insert at the end
Enter 4: to insert after a specific node
Enter 5: to display list
Enter 6: to exit
Enter your choice: 2
Enter a number: 50
Enter 1: to create linked list
Enter 2: to insert at beginning
Enter 3: to insert at the end
Enter 4: to insert after a specific node
Enter 5: to display list
Enter 6: to exit
Enter your choice: 5
50      10      20      30      40
```

3. INSERTION AT END AND DISPLAY:

```
Enter 1: to create linked list
Enter 2: to insert at beginning
Enter 3: to insert at the end
Enter 4: to insert after a specific node
Enter 5: to display list
Enter 6: to exit
Enter your choice: 3
Enter a number: 60
Enter 1: to create linked list
Enter 2: to insert at beginning
Enter 3: to insert at the end
Enter 4: to insert after a specific node
Enter 5: to display list
Enter 6: to exit
Enter your choice: 5
50      10      20      30      40      60
```

	4. INSERTION AT INDEX 2 AND DISPLAY
	`Enter 1: to create linked list`
	`Enter 2: to insert at beginning`
	`Enter 3: to insert at the end`
	`Enter 4: to insert after a specific node`
	`Enter 5: to display list`
	`Enter 6: to exit`
	`Enter your choice: 4`
	`Enter a number: 70`
	`Enter a node after which the number will be added: 20`
	`Enter 1: to create linked list`
	`Enter 2: to insert at beginning`
	`Enter 3: to insert at the end`
	`Enter 4: to insert after a specific node`
	`Enter 4: to insert after a specific node`
	`Enter 5: to display list`
	`Enter 6: to exit`
	`Enter your choice: 5`
	`50 10 20 70 30 40 60`

Practice questions	1. Create a structure called "Student" with members name, age, and total marks. Write a C program to input data for two students, display their information, and find the average of total marks. 2. Define a structure named Time with members hours, minutes, and seconds. Write a C program to input two times, add them, and display the result in proper time format. 3. Create a structure named Book to store book details like title, author, and price. Write a C program to input details for three books, find the most expensive and the lowest priced books, and display their information. 4. Write a program in C to add numbers using call by reference. 5. Write a program in C to find the maximum number between two numbers using a pointer.
Conclusion	Thus, we have studied the concept of Linked List and how it is different from arrays.