Program 7

Write A Program to Implement doubly link list with primitive operations
a) Create a doubly linked list.
b) Insert a new node to the left of the node.
c) Delete the node based on a specific value
d) Display the contents of the list

Code:

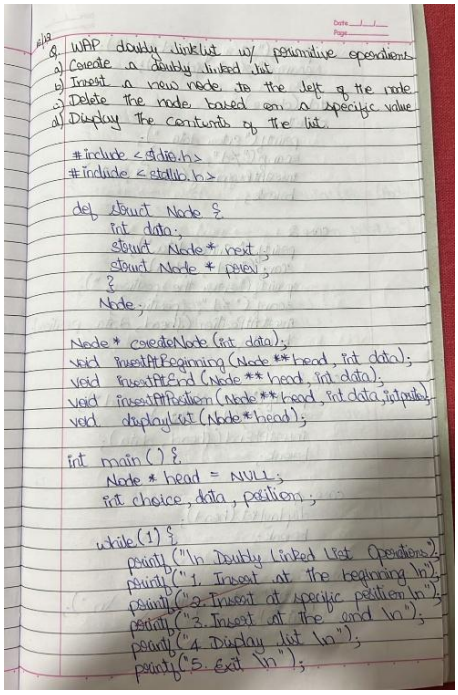
```
#include <stdio.h>
#include <stdlib.h>

struct Node {
    int data;
    struct Node* prev;
    struct Node* next;
};

struct Node* createNode(int data) {
    struct Node* newNode = (struct Node*)malloc(sizeof(struct Node));
    newNode->data = data;
    newNode->prev = NULL;
    newNode->next = NULL;
    return newNode;
}

void insertAtBeginning(struct Node** head, int data) {
    struct Node* newNode = createNode(data);
    if (*head == NULL) {
        *head = newNode;
    } else {
        newNode->next = *head;
        (*head)->prev = newNode;
        *head = newNode;
    }
}

void insertAtPosition(struct Node** head, int data, int position) {
    if (position < 1) {
        printf("Invalid position!\n");
        return;
    }

    struct Node* newNode = createNode(data);
    if (position == 1) {
        insertAtBeginning(head, data);
        return;
    }
```

```
    struct Node* temp = *head;
    for (int i = 1; temp != NULL && i < position - 1; i++) {
        temp = temp->next;
    }

    if (temp == NULL) {
        printf("Position out of bounds!\n");
        free(newNode);
        return;
    }

    newNode->next = temp->next;
    newNode->prev = temp;
    if (temp->next != NULL) {
        temp->next->prev = newNode;
    }
    temp->next = newNode;
}

void insertAtEnd(struct Node** head, int data) {
    struct Node* newNode = createNode(data);
    if (*head == NULL) {
        *head = newNode;
        return;
    }

    struct Node* temp = *head;
    while (temp->next != NULL) {
        temp = temp->next;
    }
    temp->next = newNode;
    newNode->prev = temp;
}

void displayList(struct Node* head) {
    if (head == NULL) {
        printf("List is empty!\n");
        return;
    }

    struct Node* temp = head;
    printf("List contents: ");
    while (temp != NULL) {
        printf("%d ", temp->data);
        temp = temp->next;
    }
    printf("\n");
}

int main() {
```

```
    struct Node* head = NULL;
    int choice, data, position;

    while (1) {
        printf("\nDoubly Linked List Operations:\n");
        printf("1. Insert at Beginning\n");
        printf("2. Insert at Position\n");
        printf("3. Insert at End\n");
        printf("4. Display List\n");
        printf("5. Exit\n");
        printf("Enter your choice: ");
        scanf("%d", &choice);

        switch (choice) {
            case 1:
                printf("Enter data to insert at beginning: ");
                scanf("%d", &data);
                insertAtBeginning(&head, data);
                break;
            case 2:
                printf("Enter data to insert: ");
                scanf("%d", &data);
                printf("Enter position: ");
                scanf("%d", &position);
                insertAtPosition(&head, data, position);
                break;
            case 3:
                printf("Enter data to insert at end: ");
                scanf("%d", &data);
                insertAtEnd(&head, data);
                break;
            case 4:
                displayList(head);
                break;
            case 5:
                printf("Exiting program.\n");
                exit(0);
            default:
                printf("Invalid choice! Please try again.\n");
        }
    }
    return 0;
}
```

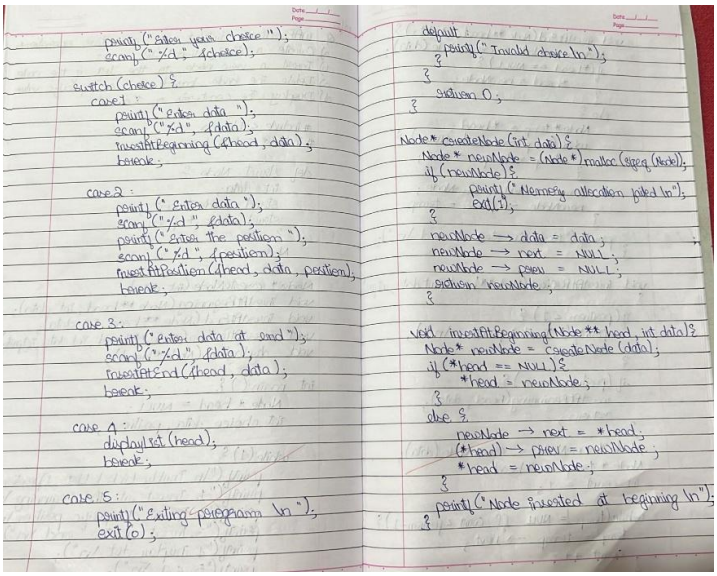
```
Doubly Linked List Operations:
1. Insert at Beginning
2. Insert at Position
3. Insert at End
4. Display List
5. Exit
Enter your choice: 1
Enter data to insert at beginning: 1

Doubly Linked List Operations:
1. Insert at Beginning
2. Insert at Position
3. Insert at End
4. Display List
5. Exit
Enter your choice: 2
Enter data to insert: 2
Enter position: 2

Doubly Linked List Operations:
1. Insert at Beginning
2. Insert at Position
3. Insert at End
4. Display List
5. Exit
Enter your choice: 3
Enter data to insert at end: 3
```

```
Doubly Linked List Operations:
1. Insert at Beginning
2. Insert at Position
3. Insert at End
4. Display List
5. Exit
Enter your choice: 4
List contents: 1 2 3

Doubly Linked List Operations:
1. Insert at Beginning
2. Insert at Position
3. Insert at End
4. Display List
5. Exit
Enter your choice: 5
Exiting program.
```

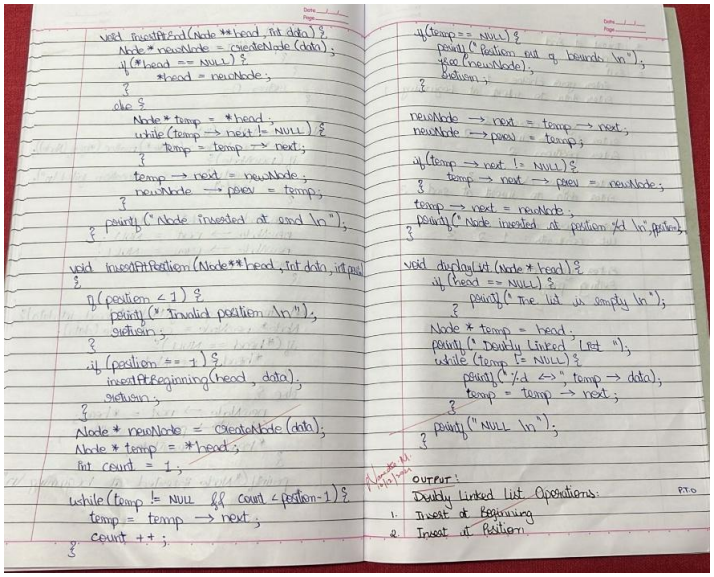


Q. WAP doubly linklist w/ primitive operations.
a) Create a doubly linked list
b) Insert a new node to the left of the node
c) Delete the node based on a specific value
d) Display the contents of the list.

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

struct Node {
    int data;
    struct Node* next;
    struct Node* prev;
};
typedef struct Node Node;

Node* createNode(int data);
void insertAtBeginning(Node **head, int data);
void insertAtEnd(Node **head, int data);
void insertAtPosition(Node **head, int data, int pos);
void displayList(Node *head);

int main() {
    Node* head = NULL;
    int choice, data, position;

    while(1) {
        printf("\n Doubly Linked List Operations:\n");
        printf("1. Insert at the beginning\n");
        printf("2. Insert at specific position\n");
        printf("3. Insert at the end\n");
        printf("4. Display list\n");
        printf("5. Exit\n");
```



```
        printf("Enter your choice ");
        scanf("%d", &choice);

        switch(choice) {
            case 1:
                printf("Enter data ");
                scanf("%d", &data);
                insertAtBeginning(&head, data);
                break;

            case 2:
                printf("Enter data ");
                scanf("%d", &data);
                printf("Enter the position ");
                scanf("%d", &position);
                insertAtPosition(&head, data, position);
                break;

            case 3:
                printf("Enter data at end");
                scanf("%d", &data);
                insertAtEnd(&head, data);
                break;

            case 4:
                displayList(head);
                break;

            case 5:
                printf("Exiting program\n");
                exit(0);

            default:
                printf("Invalid choice\n");
        }
    }
    return 0;
}

Node* createNode(int data) {
    Node* newNode = (Node*)malloc(sizeof(Node));
    if(newNode) {
        printf("Memory allocation failed\n");
        exit(1);
    }
    newNode->data = data;
    newNode->next = NULL;
    newNode->prev = NULL;
    return newNode;
}

void insertAtBeginning(Node** head, int data) {
    Node* newNode = createNode(data);
    if(*head == NULL) {
        *head = newNode;
    }
    else {
        newNode->next = *head;
        (*head)->prev = newNode;
        *head = newNode;
    }
    printf("Node inserted at beginning\n");
}
```



```
void insertAtEnd(Node **head, int data) {
    Node *newNode = createNode(data);
    if(*head == NULL) {
        *head = newNode;
    }
    else {
        Node *temp = *head;
        while(temp -> next != NULL) {
            temp = temp -> next;
        }
        temp -> next = newNode;
        newNode -> prev = temp;
    }
    printf("Node inserted at end \n");
}

void insertAtPosition(Node **head, int data, int pos)
{
    if(position < 1) {
        printf("Invalid position \n");
        return;
    }
    if(position == 1) {
        insertAtBeginning(head, data);
        return;
    }
    Node *newNode = createNode(data);
    Node *temp = *head;
    int count = 1;
    while(temp != NULL && count < position-1) {
        temp = temp -> next;
        count++;
    }
```

```
    if(temp == NULL) {
        printf("Position out of bounds \n");
        free(newNode);
        return;
    }
    newNode -> next = temp -> next;
    newNode -> prev = temp;
    if(temp -> next != NULL) {
        temp -> next -> prev = newNode;
    }
    temp -> next = newNode;
    printf("Node inserted at position %d \n", position);
}

void displayList(Node *head) {
    if(head == NULL) {
        printf("The list is empty \n");
        return;
    }
    Node *temp = head;
    printf("Doubly Linked List ");
    while(temp != NULL) {
        printf("%d <-> ", temp -> data);
        temp = temp -> next;
    }
    printf("NULL \n");
}
```

OUTPUT:

Doubly Linked List Operations: P.T.O

1. Insert at Beginning
2. Insert at Position
3. Insert at End
4. Display List
5. Exit

Enter your choice : 1
Enter data to insert at beginning : 1

Enter your choice : 2
Enter data to insert : 2
Enter position : 2

Enter your choice : 3
Enter data to insert at end : 3

Enter your choice : 4
List contents : 1 2 3

Enter your choice : 5
Exiting program...