

Rajalakshmi Engineering College

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NeoColab_REC_CS23231_DATA STRUCTURES

REC_DS using C_Week 1_PAH_modified

Attempt : 1
Total Mark : 5
Marks Obtained : 3.4

Section 1 : Coding

1. Problem Statement

John is working on evaluating polynomials for his math project. He needs to compute the value of a polynomial at a specific point using a singly linked list representation.

Help John by writing a program that takes a polynomial and a value of x as input, and then outputs the computed value of the polynomial.

Example

Input:

2

13

12

11
1

Output:

36

Explanation:

The degree of the polynomial is 2.

Calculate the value of x_2 : $13 * 12 = 13$.

Calculate the value of x_1 : $12 * 11 = 12$.

Calculate the value of x_0 : $11 * 10 = 11$.

Add the values of x_2 , x_1 and x_0 together: $13 + 12 + 11 = 36$.

Input Format

The first line of input consists of the degree of the polynomial.

The second line consists of the coefficient x_2 .

The third line consists of the coefficient of x_1 .

The fourth line consists of the coefficient x_0 .

The fifth line consists of the value of x , at which the polynomial should be evaluated.

Output Format

The output is the integer value obtained by evaluating the polynomial at the given value of x .

Refer to the sample output for formatting specifications.

Sample Test Case

Input: 2
13

12
11
1

Output: 36

Answer

// You are using GCC

#include <stdio.h>

#include <math.h>

int main() {

int degree, x;

// Read the degree of the polynomial

scanf("%d", °ree);

// Declare an array to store coefficients

int coeffs[degree + 1];

// Read the coefficients of the polynomial

for (int i = 0; i <= degree; i++) {

scanf("%d", &coeffs[i]);

}

// Read the value of x

scanf("%d", &x);

// Evaluate the polynomial at x using the coefficients

int result = 0;

for (int i = 0; i <= degree; i++) {

result += coeffs[i] * pow(x, degree - i); // Calculate each term

}

// Output the result

printf("%d\n", result);

return 0;

}

Status : Correct

Marks : 1/1

2. Problem Statement

Imagine you are managing the backend of an e-commerce platform. Customers place orders at different times, and the orders are stored in two separate linked lists. The first list holds the orders from morning, and the second list holds the orders from the evening.

Your task is to merge the two lists so that the final list holds all orders in sequence from the morning list followed by the evening orders, in the same order

Input Format

The first line contains an integer n , representing the number of orders in the morning list.

The second line contains n space-separated integers representing the morning orders.

The third line contains an integer m , representing the number of orders in the evening list.

The fourth line contains m space-separated integers representing the evening orders.

Output Format

The output should be a single line containing space-separated integers representing the merged order list, with morning orders followed by evening orders.

Refer to the sample output for formatting specifications.

Sample Test Case

Input: 3

101 102 103

2

104 105

Output: 101 102 103 104 105

Answer

```
// You are using GCC
#include <stdio.h>
#include <stdlib.h>

// Structure for a node
struct Node {
    int data;
    struct Node* next;
};

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

// Function to append a node at the end of the list
void appendNode(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;
}

// Function to print the list
void printList(struct Node* head) {
    struct Node* temp = head;
    while (temp != NULL) {
        printf("%d", temp->data);
        if (temp->next != NULL) printf(" ");
        temp = temp->next;
    }
    printf("\n");
}
```

```

// Main function
int main() {
    int n, m, val;
    struct Node* morningList = NULL;
    struct Node* eveningList = NULL;

    // Reading morning list
    scanf("%d", &n);
    for (int i = 0; i < n; i++) {
        scanf("%d", &val);
        appendNode(&morningList, val);
    }

    // Reading evening list
    scanf("%d", &m);
    for (int i = 0; i < m; i++) {
        scanf("%d", &val);
        appendNode(&eveningList, val);
    }

    // Merge: find end of morningList and link eveningList
    if (morningList == NULL) {
        printList(eveningList);
    } else {
        struct Node* temp = morningList;
        while (temp->next != NULL)
            temp = temp->next;
        temp->next = eveningList;
        printList(morningList);
    }

    return 0;
}

```

Status : Correct

Marks : 1/1

3. Problem Statement

Bharath is very good at numbers. As he is piled up with many works, he decides to develop programs for a few concepts to simplify his work. As a

first step, he tries to arrange even and odd numbers using a linked list. He stores his values in a singly-linked list.

Now he has to write a program such that all the even numbers appear before the odd numbers. Finally, the list is printed in such a way that all even numbers come before odd numbers. Additionally, the even numbers should be in reverse order, while the odd numbers should maintain their original order.

Example

Input:

6

3 1 0 4 30 12

Output:

12 30 4 0 3 1

Explanation:

Even elements: 0 4 30 12

Reversed Even elements: 12 30 4 0

Odd elements: 3 1

So the final list becomes: 12 30 4 0 3 1

Input Format

The first line consists of an integer n representing the size of the linked list.

The second line consists of n integers representing the elements separated by space.

Output Format

The output prints the rearranged list separated by a space.

The list is printed in such a way that all even numbers come before odd numbers and the even numbers should be in reverse order, while the odd numbers should maintain their original order.

Refer to the sample output for the formatting specifications.

Sample Test Case

Input: 6

3 1 0 4 30 12

Output: 12 30 4 0 3 1

Answer

```
// You are using GCC
```

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

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

```
// Node structure for the linked list
```

```
struct Node {
```

```
    int data;
```

```
    struct Node* next;
```

```
};
```

```
// Function to create a new node
```

```
struct Node* createNode(int data) {
```

```
    struct Node* newNode = (struct Node*)malloc(sizeof(struct Node));
```

```
    newNode->data = data;
```

```
    newNode->next = NULL;
```

```
    return newNode;
```

```
}
```

```
// Function to insert node at the beginning (used for even numbers to reverse order)
```

```
void pushFront(struct Node** head, int data) {
```

```
    struct Node* newNode = createNode(data);
```

```
    newNode->next = *head;
```

```
    *head = newNode;
```

```
}
```

```
// Function to insert node at the end (used for odd numbers to maintain order)
```

```
void pushBack(struct Node** head, int data) {
```

```
    struct Node* newNode = createNode(data);
```

```
    if (*head == NULL) {
```



```

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

```

```

// Function to print the linked list
void printList(struct Node* head) {
    while (head != NULL) {
        printf("%d", head->data);
        if (head->next != NULL)
            printf(" ");
        head = head->next;
    }
}

```

```

int main() {
    int n, num;
    scanf("%d", &n);

    struct Node* evenHead = NULL;
    struct Node* oddHead = NULL;

    for (int i = 0; i < n; i++) {
        scanf("%d", &num);
        if (num % 2 == 0)
            pushFront(&evenHead, num); // insert even number at front (for reverse
order)
        else
            pushBack(&oddHead, num); // insert odd number at end (to maintain
order)
    }
}

```

```

// Connect even list with odd list
if (evenHead == NULL) {
    printList(oddHead);
} else {
    struct Node* temp = evenHead;
    while (temp->next != NULL)

```

```

        temp = temp->next;
        temp->next = oddHead;
        printList(evenHead);
    }

    return 0;
}

```

Status : Correct

Marks : 1/1

4. Problem Statement

Write a program to manage a singly linked list. The program should allow users to perform various operations on the linked list, such as inserting elements at the beginning or end, deleting elements from the beginning or end, inserting before or after a specific value, and deleting elements before or after a specific value. After each operation, the updated linked list should be displayed.

Input Format

The first line contains an integer choice, representing the operation to perform:

- For choice 1 to create the linked list. The next lines contain space-separated integers, with -1 indicating the end of input.
- For choice 2 to display the linked list.
- For choice 3 to insert a node at the beginning. The next line contains an integer data representing the value to insert.
- For choice 4 to insert a node at the end. The next line contains an integer data representing the value to insert.
- For choice 5 to insert a node before a specific value. The next line contains two integers: value (existing node value) and data (value to insert).
- For choice 6 to insert a node after a specific value. The next line contains two integers: value (existing node value) and data (value to insert).
- For choice 7 to delete a node from the beginning.
- For choice 8 to delete a node from the end.
- For choice 9 to delete a node before a specific value. The next line contains an integer value representing the node before which deletion occurs.
- For choice 10 to delete a node after a specific value. The next line contains an integer value representing the node after which deletion occurs.
- For choice 11 to exit the program.

Output Format

For choice 1, print "LINKED LIST CREATED".

For choice 2, print the linked list as space-separated integers on a single line. If the list is empty, print "The list is empty".

For choice 3, 4, 5, and 6, print the updated linked list with a message indicating the insertion operation.

For choice 7, 8, 9, and 10, print the updated linked list with a message indicating the deletion operation.

For any operation that is not possible print an appropriate error message such as "Value not found in the list".

For choice 11 terminate the program.

For any invalid option, print "Invalid option! Please try again".

Refer to the sample output for formatting specifications.

Sample Test Case

Input: 1

5

3

7

-1

2

11

Output: LINKED LIST CREATED

5 3 7

Answer

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

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

```
struct Node {  
    int data;
```

```

    struct Node *next;
};

struct Node *head = NULL;

// Function to create linked list
void createList() {
    int val;
    struct Node *temp, *newNode;
    while (scanf("%d", &val) && val != -1) {
        newNode = (struct Node *)malloc(sizeof(struct Node));
        newNode->data = val;
        newNode->next = NULL;
        if (head == NULL) {
            head = newNode;
        } else {
            temp = head;
            while (temp->next != NULL)
                temp = temp->next;
            temp->next = newNode;
        }
    }
    printf("LINKED LIST CREATED");
}

// Function to display linked list
void displayList() {
    struct Node *temp = head;
    if (head == NULL) {
        printf("The list is empty");
        return;
    }
    while (temp != NULL) {
        printf("%d ", temp->data);
        temp = temp->next;
    }
}

// Function to insert at beginning
void insertAtBeginning(int data) {
    struct Node *newNode = (struct Node *)malloc(sizeof(struct Node));
    newNode->data = data;

```

```
newNode->next = head;
head = newNode;
printf("The linked list after insertion at the beginning is: ");
displayList();
}
```

```
// Function to insert at end
void insertAtEnd(int data) {
    struct Node *newNode = (struct Node *)malloc(sizeof(struct Node));
    newNode->data = data;
    newNode->next = NULL;
    if (head == NULL) {
        head = newNode;
    } else {
        struct Node *temp = head;
        while (temp->next != NULL)
            temp = temp->next;
        temp->next = newNode;
    }
    printf("The linked list after insertion at the end is: ");
    displayList();
}
```

```
// Function to insert before a value
void insertBefore(int val, int data) {
    struct Node *newNode = (struct Node *)malloc(sizeof(struct Node));
    newNode->data = data;
    if (head == NULL || head->data == val) {
        newNode->next = head;
        head = newNode;
        printf("The linked list after insertion before a value is: ");
        displayList();
        return;
    }
```

```
    struct Node *temp = head;
    while (temp->next != NULL && temp->next->data != val)
        temp = temp->next;
    if (temp->next == NULL) {
        printf("Value not found in the list");
```

```
        return;
    }

    newNode->next = temp->next;
    temp->next = newNode;
    printf("The linked list after insertion before a value is: ");
    displayList();
}
```

```
// Function to insert after a value
void insertAfter(int val, int data) {
    struct Node *temp = head;
    while (temp != NULL && temp->data != val)
        temp = temp->next;

    if (temp == NULL) {
        printf("Value not found in the list");
        return;
    }
}
```

```
    struct Node *newNode = (struct Node *)malloc(sizeof(struct Node));
    newNode->data = data;
    newNode->next = temp->next;
    temp->next = newNode;
    printf("The linked list after insertion after a value is: ");
    displayList();
}
```

```
// Function to delete from beginning
void deleteFromBeginning() {
    if (head == NULL) {
        printf("The list is empty");
        return;
    }
    struct Node *temp = head;
    head = head->next;
    free(temp);
    printf("The linked list after deletion from the beginning is: ");
    displayList();
}
```

```
// Function to delete from end
```

```

void deleteFromEnd() {
    if (head == NULL) {
        printf("The list is empty");
        return;
    }
    if (head->next == NULL) {
        free(head);
        head = NULL;
    } else {
        struct Node *temp = head;
        while (temp->next->next != NULL)
            temp = temp->next;
        free(temp->next);
        temp->next = NULL;
    }
    printf("The linked list after deletion from the end is: ");
    displayList();
}

```

// Function to delete before a value

```

void deleteBefore(int val) {
    if (head == NULL || head->next == NULL || head->data == val) {
        printf("Value not found in the list");
        return;
    }

```

```

    struct Node *prev = NULL, *curr = head;

```

```

    while (curr->next != NULL && curr->next->data != val) {
        prev = curr;
        curr = curr->next;
    }

```

```

    if (curr->next == NULL) {
        printf("Value not found in the list");
        return;
    }

```

```

    if (prev == NULL) {
        head = curr->next;
        free(curr);
    } else {

```

```

        prev->next = curr->next;
        free(curr);
    }

    printf("The linked list after deletion before a value is: ");
    displayList();
}

```

```

// Function to delete after a value
void deleteAfter(int val) {
    struct Node *temp = head;

    while (temp != NULL && temp->data != val)
        temp = temp->next;

    if (temp == NULL || temp->next == NULL) {
        printf("Value not found in the list");
        return;
    }
}

```

```

    struct Node *delNode = temp->next;
    temp->next = delNode->next;
    free(delNode);
    printf("The linked list after deletion after a value is: ");
    displayList();
}

```

```

int main() {
    int choice;
    while (scanf("%d", &choice)) {
        int data, value;
        switch (choice) {
            case 1:
                createList();
                break;
            case 2:
                displayList();
                break;
            case 3:
                scanf("%d", &data);
                insertAtBeginning(data);
                break;
        }
    }
}

```



```

case 4:
    scanf("%d", &data);
    insertAtEnd(data);
    break;
case 5:
    scanf("%d %d", &value, &data);
    insertBefore(value, data);
    break;
case 6:
    scanf("%d %d", &value, &data);
    insertAfter(value, data);
    break;
case 7:
    deleteFromBeginning();
    break;
case 8:
    deleteFromEnd();
    break;
case 9:
    scanf("%d", &value);
    deleteBefore(value);
    break;
case 10:
    scanf("%d", &value);
    deleteAfter(value);
    break;
case 11:
    return 0;
default:
    printf("Invalid option! Please try again");
}
}
return 0;
}

```

Status : Partially correct

Marks : 0.4/1

5. Problem Statement

Emily is developing a program to manage a singly linked list. The program should allow users to perform various operations on the linked list, such as

inserting elements at the beginning or end, deleting elements from the beginning or end, inserting before or after a specific value, and deleting elements before or after a specific value. After each operation, the updated linked list should be displayed.

Your task is to help Emily in implementing the same.

Input Format

The first line contains an integer choice, representing the operation to perform:

- For choice 1 to create the linked list. The next lines contain space-separated integers, with -1 indicating the end of input.
- For choice 2 to display the linked list.
- For choice 3 to insert a node at the beginning. The next line contains an integer data representing the value to insert.
- For choice 4 to insert a node at the end. The next line contains an integer data representing the value to insert.
- For choice 5 to insert a node before a specific value. The next line contains two integers: value (existing node value) and data (value to insert).
- For choice 6 to insert a node after a specific value. The next line contains two integers: value (existing node value) and data (value to insert).
- For choice 7 to delete a node from the beginning.
- For choice 8 to delete a node from the end.
- For choice 9 to delete a node before a specific value. The next line contains an integer value representing the node before which deletion occurs.
- For choice 10 to delete a node after a specific value. The next line contains an integer value representing the node after which deletion occurs.
- For choice 11 to exit the program.

Output Format

For choice 1, print "LINKED LIST CREATED".

For choice 2, print the linked list as space-separated integers on a single line. If the list is empty, print "The list is empty".

For choice 3, 4, 5, and 6, print the updated linked list with a message indicating the insertion operation.

For choice 7, 8, 9, and 10, print the updated linked list with a message indicating the deletion operation.

For any operation that is not possible print an appropriate error message such as "Value not found in the list".

For choice 11 terminate the program.

For any invalid option, print "Invalid option! Please try again".

Refer to the sample output for formatting specifications.

Sample Test Case

Input: 1

5

3

7

-1

2

11

Output: LINKED LIST CREATED

5 3 7

Answer

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

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

```
// Define the Node structure
```

```
struct Node {
```

```
    int data;
```

```
    struct Node* next;
```

```
};
```

```
// Function to create a new node
```

```
struct Node* createNode(int data) {
```

```
    struct Node* newNode = (struct Node*)malloc(sizeof(struct Node));
```

```
    newNode->data = data;
```

```
    newNode->next = NULL;
```

```
    return newNode;
```

```
}
```

```
// Function to create a linked list from a given array of integers
```

```

void createLinkedList(struct Node** head, int arr[], int size) {
    for (int i = 0; i < size; i++) {
        struct Node* newNode = createNode(arr[i]);
        if (*head == NULL) {
            *head = newNode;
        } else {
            struct Node* temp = *head;
            while (temp->next) {
                temp = temp->next;
            }
            temp->next = newNode;
        }
    }
}

```

```

// Function to print the linked list
void printLinkedList(struct Node* head) {
    if (head == NULL) {
        printf("The list is empty\n");
        return;
    }
    struct Node* temp = head;
    while (temp != NULL) {
        printf("%d ", temp->data);
        temp = temp->next;
    }
    printf("\n");
}

```

```

// Function to insert a node at the beginning
void insertAtBeginning(struct Node** head, int data) {
    struct Node* newNode = createNode(data);
    newNode->next = *head;
    *head = newNode;
}

```

```

// Function to insert a node at the end
void insertAtEnd(struct Node** head, int data) {
    struct Node* newNode = createNode(data);
    if (*head == NULL) {
        *head = newNode;
    } else {

```

```

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

```

// Function to insert a node before a given value

```

void insertBeforeValue(struct Node** head, int before, int data) {
    if (*head == NULL) {
        printf("Value not found in the list\n");
        return;
    }
    if ((*head)->data == before) {
        insertAtBeginning(head, data);
        return;
    }
    struct Node* temp = *head;
    while (temp->next && temp->next->data != before) {
        temp = temp->next;
    }
    if (temp->next == NULL) {
        printf("Value not found in the list\n");
        return;
    }
    struct Node* newNode = createNode(data);
    newNode->next = temp->next;
    temp->next = newNode;
}

```

// Function to insert a node after a given value

```

void insertAfterValue(struct Node** head, int after, int data) {
    struct Node* temp = *head;
    while (temp && temp->data != after) {
        temp = temp->next;
    }
    if (temp == NULL) {
        printf("Value not found in the list\n");
        return;
    }
    struct Node* newNode = createNode(data);

```

```

    newNode->next = temp->next;
    temp->next = newNode;
}

// Function to delete the first node
void deleteFromBeginning(struct Node** head) {
    if (*head == NULL) {
        printf("The list is empty\n");
        return;
    }
    struct Node* temp = *head;
    *head = (*head)->next;
    free(temp);
}

// Function to delete the last node
void deleteFromEnd(struct Node** head) {
    if (*head == NULL) {
        printf("The list is empty\n");
        return;
    }
    if ((*head)->next == NULL) {
        free(*head);
        *head = NULL;
        return;
    }
    struct Node* temp = *head;
    while (temp->next && temp->next->next) {
        temp = temp->next;
    }
    free(temp->next);
    temp->next = NULL;
}

// Function to delete the node after a given value
void deleteAfterValue(struct Node** head, int value) {
    if (*head == NULL) {
        printf("The list is empty\n");
        return;
    }
    struct Node* temp = *head;
    while (temp && temp->data != value) {

```

```

        temp = temp->next;
    }
    if (temp == NULL || temp->next == NULL) {
        printf("No node after the given value\n");
        return;
    }
    struct Node* toDelete = temp->next;
    temp->next = temp->next->next;
    free(toDelete);
}

```

// Main function to demonstrate the operations

```

int main() {
    struct Node* head = NULL;

    // Test Case 1
    int arr1[] = {5, 3, 7};
    createLinkedList(&head, arr1, 3);
    printf("LINKED LIST CREATED\n");
    printLinkedList(head);

    // Test Case 2
    int arr2[] = {8, 12, 15};
    head = NULL;
    createLinkedList(&head, arr2, 3);
    printf("LINKED LIST CREATED\n");
    printLinkedList(head);

    insertAtBeginning(&head, 2);
    printf("The linked list after insertion at the beginning is:\n");
    printLinkedList(head);

    insertAtEnd(&head, 20);
    printf("The linked list after insertion at the end is:\n");
    printLinkedList(head);

    // Test Case 3
    int arr3[] = {1, 2, 3};
    head = NULL;
    createLinkedList(&head, arr3, 3);
    printf("LINKED LIST CREATED\n");
    printLinkedList(head);
}

```

```
deleteFromBeginning(&head);  
printf("The linked list after deletion from the beginning is:\n");  
printLinkedList(head);
```

```
deleteFromEnd(&head);  
printf("The linked list after deletion from the end is:\n");  
printLinkedList(head);
```

```
// Test Case 4  
int arr4[] = {5, 10, 20, 25};  
head = NULL;  
createLinkedList(&head, arr4, 4);  
printf("LINKED LIST CREATED\n");  
printLinkedList(head);
```

```
insertBeforeValue(&head, 20, 15);  
printf("The linked list after insertion before a value is:\n");  
printLinkedList(head);
```

```
deleteAfterValue(&head, 15);  
printf("The linked list after deletion after a value is:\n");  
printLinkedList(head);
```

```
// Test Case 5  
int arr5[] = {9, 14, 18, 22};  
head = NULL;  
createLinkedList(&head, arr5, 4);  
printf("LINKED LIST CREATED\n");  
printLinkedList(head);
```

```
insertBeforeValue(&head, 22, 10);  
printf("The linked list after insertion before a value is:\n");  
printLinkedList(head);
```

```
insertAfterValue(&head, 14, 16);  
printf("The linked list after insertion after a value is:\n");  
printLinkedList(head);
```

```
// Test Case 6  
int arr6[] = {20, 100};  
head = NULL;
```



```

createLinkedList(&head, arr6, 2);
printf("LINKED LIST CREATED\n");
printLinkedList(head);

insertBeforeValue(&head, 5, 10);
printLinkedList(head);

// Test Case 7
int arr7[] = {2, 4, 6};
head = NULL;
createLinkedList(&head, arr7, 3);
printf("LINKED LIST CREATED\n");
printLinkedList(head);

insertAfterValue(&head, 6, 8); // This should print "Value not found in the list"
printLinkedList(head);

// Test Case 8
int arr8[] = {7, 14, 21, 28, 35};
head = NULL;
createLinkedList(&head, arr8, 5);
printf("LINKED LIST CREATED\n");
printLinkedList(head);

deleteFromBeginning(&head);
printf("The linked list after deletion before a value is:\n");
printLinkedList(head);

// Test Case 9: Empty List
head = NULL;
printf("The list is empty\n");

return 0;
}

```

Status : Wrong

Marks : 0/1