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NeoColab_REC_CS23231_DATA STRUCTURES

REC_DS using C_Week 1_PAH_modified

Attempt : 2
Total Mark : 5
Marks Obtained : 3.8

Section 1 : Coding

1. 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

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

// Define structure for a linked list 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 a list
void appendNode(struct Node** headRef, int data) {
    struct Node* newNode = createNode(data);
    if (*headRef == NULL) {
        *headRef = newNode;
        return;
    }
    struct Node* temp = *headRef;
    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);
        head = head->next;
    }
    printf("\n");
}

// Function to merge two lists by appending second to the end of the first
struct Node* mergeLists(struct Node* morning, struct Node* evening) {
    if (morning == NULL) return evening;
    struct Node* temp = morning;
    while (temp->next != NULL) {
        temp = temp->next;
    }
    temp->next = evening;
    return morning;
}

int main() {
    int n, m, order_id;
    struct Node* morningHead = NULL;
    struct Node* eveningHead = NULL;

    // Read morning orders
```

```
    scanf("%d", &n);
    for (int i = 0; i < n; i++) {
        scanf("%d", &order_id);
        appendNode(&morningHead, order_id);
    }

    // Read evening orders
    scanf("%d", &m);
    for (int i = 0; i < m; i++) {
        scanf("%d", &order_id);
        appendNode(&eveningHead, order_id);
    }

    // Merge and print the final order list
    struct Node* merged = mergeLists(morningHead, eveningHead);
    printList(merged);

    return 0;
}
// You are using GCC
```

Status : Correct **Marks : 1/1**

2. 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 x2: 13 * 12 = 13.

Calculate the value of x1: 12 * 11 = 12.

Calculate the value of x0: 11 * 10 = 11.

Add the values of x2, x1 and x0 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 x2.

The third line consists of the coefficient of x1.

The fourth line consists of the coefficient x0.

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

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

// Define the node structure
struct Node {
    int coefficient;
    struct Node* next;
};

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

// Function to append a node at the end of the list
void appendNode(struct Node** head, int coeff) {
    struct Node* newNode = createNode(coeff);
    if (*head == NULL) {
        *head = newNode;
        return;
    }
    struct Node* temp = *head;
    while (temp->next != NULL)
        temp = temp->next;
    temp->next = newNode;
}

// Function to evaluate the polynomial at a given x
int evaluatePolynomial(struct Node* head, int degree, int x) {
    int result = 0;
    struct Node* temp = head;
    while (temp != NULL) {
```

```
        result += temp->coefficient * pow(x, degree);
        degree--;
        temp = temp->next;
    }
    return result;
}

int main() {
    int degree, x, coeff;
    struct Node* head = NULL;

    // Read degree of the polynomial
    scanf("%d", &degree);

    // Read coefficients from highest degree to constant term
    for (int i = 0; i <= degree; i++) {
        scanf("%d", &coeff);
        appendNode(&head, coeff);
    }

    // Read value of x
    scanf("%d", &x);

    // Evaluate and print the result
    int result = evaluatePolynomial(head, degree, x);
    printf("%d\n", result);

    return 0;
}
```

Status : Correct **Marks : 1/1**

3. 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 node structure
struct Node {
    int data;
    struct Node* next;
};

struct Node* head = NULL;

// Function to create the list
void createList() {
    int value;
    struct Node *newNode, *tail = NULL;
    while (scanf("%d", &value), value != -1) {
        newNode = (struct Node*)malloc(sizeof(struct Node));
        newNode->data = value;
        newNode->next = NULL;
        if (head == NULL) {
            head = newNode;
```

```
            tail = newNode;
        } else {
            tail->next = newNode;
            tail = newNode;
        }
    }
    printf("LINKED LIST CREATED\n");
}

// Function to display the list
void displayList() {
    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");
}

// 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();
}

// 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();
}

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

    if (temp->next == NULL) {
        printf("Value not found in the list\n");
        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 before a value is: ");
    displayList();
}

// Insert after a value
void insertAfterValue(int value, int data) {
    struct Node* temp = head;
    while (temp != NULL && temp->data != value)
        temp = temp->next;

    if (temp == NULL) {
```

```
        printf("Value not found in the list\n");
        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();
}

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

// Delete from end
void deleteFromEnd() {
    if (head == NULL) 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();
}

// Delete before a value
void deleteBeforeValue(int value) {
    if (head == NULL || head->next == NULL) {
```

```
        printf("Value not found in the list\n");
        return;
    }

    struct Node *prev = NULL, *curr = head, *next = head->next;

    if (head->next->data == value) {
        head = next;
        free(curr);
        printf("The linked list after deletion before a value is: ");
        displayList();
        return;
    }

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

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

    curr->next = next->next;
    free(next);
    printf("The linked list after deletion before a value is: ");
    displayList();
}

// Delete after a value
void deleteAfterValue(int value) {
    struct Node* temp = head;
    while (temp != NULL && temp->data != value)
        temp = temp->next;

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

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

// Main menu driver
int main() {
    int choice, value, data;

    while (1) {
        scanf("%d", &choice);
        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);
                insertBeforeValue(value, data);
                break;
            case 6:
                scanf("%d %d", &value, &data);
                insertAfterValue(value, data);
                break;
            case 7:
                deleteFromBeginning();
                break;
            case 8:
                deleteFromEnd();
                break;
```

```
            case 9:
                scanf("%d", &value);
                deleteBeforeValue(value);
                break;
            case 10:
                scanf("%d", &value);
                deleteAfterValue(value);
                break;
            case 11:
                exit(0);
            default:
                printf("Invalid option! Please try again\n");
        }
    }

    return 0;
}
```

Status : Partially correct **Marks : 0.4/1**

4. 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

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

// Define structure for a node
```

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

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

// Function to push node at beginning (used for even list to reverse order)
void push(struct Node** head, int value) {
    struct Node* newNode = createNode(value);
    newNode->next = *head;
    *head = newNode;
}

// Function to append node at end (used for odd list to maintain order)
void append(struct Node** head, struct Node** tail, int value) {
    struct Node* newNode = createNode(value);
    if (*head == NULL) {
        *head = *tail = newNode;
    } else {
        (*tail)->next = newNode;
        *tail = newNode;
    }
}

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

int main() {
    int n, val;
```

```
    struct Node *evenHead = NULL;
    struct Node *oddHead = NULL, *oddTail = NULL;

    // Input list size
    scanf("%d", &n);

    // Read values and build even/odd lists
    for (int i = 0; i < n; i++) {
        scanf("%d", &val);
        if (val % 2 == 0)
            push(&evenHead, val);  // Insert even at beginning (reverses order)
        else
            append(&oddHead, &oddTail, val);  // Insert odd at end (maintains order)
    }

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

    return 0;
}
// You are using GCC
```

Status : Correct **Marks : 1/1**

5. 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>

// Define the structure for a node
struct Node {
    int data;
    struct Node* next;
};

struct Node* head = NULL;

// Function to create the list
void createList() {
    int value;
    struct Node* newNode, *tail = NULL;
    while (scanf("%d", &value), value != -1) {
        newNode = (struct Node*) malloc(sizeof(struct Node));
        newNode->data = value;
        newNode->next = NULL;
        if (head == NULL) {
            head = tail = newNode;
        } else {
            tail->next = newNode;
            tail = newNode;
        }
```

```
    }
    printf("LINKED LIST CREATED\n");
}

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

// 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();
}

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

```
}

// Insert before value
void insertBefore(int target, int data) {
    if (head == NULL) {
        printf("Value not found in the list\n");
        return;
    }

    if (head->data == target) {
        insertAtBeginning(data);
        return;
    }

    struct Node *temp = head;
    while (temp->next && temp->next->data != target)
        temp = temp->next;

    if (temp->next == NULL) {
        printf("Value not found in the list\n");
        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 before a value is: ");
    displayList();
}

// Insert after value
void insertAfter(int target, int data) {
    struct Node* temp = head;
    while (temp && temp->data != target)
        temp = temp->next;

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

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

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

// Delete before a value
void deleteBefore(int target) {
    if (!head || !head->next) {
        printf("Value not found in the list\n");
        return;
```

```
    }

    if (head->next->data == target) {
        struct Node* temp = head;
        head = head->next;
        free(temp);
        printf("The linked list after deletion before a value is: ");
        displayList();
        return;
    }

    struct Node *prev = NULL, *curr = head, *next = head->next;
    while (next->next && next->next->data != target) {
        prev = curr;
        curr = next;
        next = next->next;
    }

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

    curr->next = next->next;
    free(next);
    printf("The linked list after deletion before a value is: ");
    displayList();
}

// Delete after a value
void deleteAfter(int target) {
    struct Node* temp = head;
    while (temp && temp->data != target)
        temp = temp->next;

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

    struct Node* toDelete = temp->next;
    temp->next = toDelete->next;
```

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

// Main driver
int main() {
    int choice, a, b;

    while (1) {
        if (scanf("%d", &choice) != 1) break;

        switch (choice) {
            case 1:
                createList();
                break;
            case 2:
                displayList();
                break;
            case 3:
                scanf("%d", &a);
                insertAtBeginning(a);
                break;
            case 4:
                scanf("%d", &a);
                insertAtEnd(a);
                break;
            case 5:
                scanf("%d %d", &a, &b);
                insertBefore(a, b);
                break;
            case 6:
                scanf("%d %d", &a, &b);
                insertAfter(a, b);
                break;
            case 7:
                deleteFromBeginning();
                break;
            case 8:
                deleteFromEnd();
                break;
            case 9:
```

```
            scanf("%d", &a);
            deleteBefore(a);
            break;
        case 10:
            scanf("%d", &a);
            deleteAfter(a);
            break;
        case 11:
            exit(0);
        default:
            printf("Invalid option! Please try again\n");
    }
  }

  return 0;
}
// You are using GCC
```

Status : Partially correct **Marks : 0.4/1**