# Rajalakshmi Engineering College

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Batch: 2028

Degree: B.E - CSE



## NeoColab\_REC\_CS23231\_DATA STRUCTURES

REC\_DS using C\_Week 1\_PAH\_modified

Attempt : 1 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
 104 105
 Output: 101 102 103 104 105
Answer
// You are using GCC
#include <stdio.h>
 #include <stdlib.h>
 // Node structure for linked list
typedef struct Node {
   int data:
   struct Node* next;
 } Node;
 // Function to create a new node
 Node* createNode(int data) {
   Node* newNode = (Node*)malloc(sizeof(Node));
 newNode->data = data;
   newNode->next = NULL:
```

```
return newNode;
    // Function to insert a node at the end of a linked list
    void insertEnd(Node** head, int data) {
      Node* newNode = createNode(data);
      if (*head == NULL) {
         *head = newNode;
         return;
      Node* temp = *head;
      while (temp->next != NULL) {
         temp = temp->next;
temp->next = newNode;
    // Function to merge two linked lists
    Node* mergeLists(Node* head1, Node* head2) {
      if (head1 == NULL) return head2;
      if (head2 == NULL) return head1;
      Node* temp = head1;
      while (temp->next != NULL) {
         temp = temp->next;
next =-----
return head1;
}
      temp->next = head2;
    // Function to print the linked list
    void printList(Node* head) {
      Node* temp = head;
      while (temp != NULL) {
         printf("%d ", temp->data);
         temp = temp->next;
      printf("\n");
    // Main function
int main() {
```

```
int n, m, val;
 Node* morningList = NULL
 Node* eveningList = NULL;
  // Input morning list
 scanf("%d", &n);
 for (int i = 0; i < n; i++) {
    scanf("%d", &val);
    insertEnd(&morningList, val);
 }
 // Input evening list
 scanf("%d", &m);
 for (int i = 0; i < m; i++) {
   <sup>3</sup> scanf("%d", &val);
    insertEnd(&eveningList, val);
 // Merge lists
  Node* mergedList = mergeLists(morningList, eveningList);
 // Print merged list
  printList(mergedList);
  return 0;
Status: Correct
                                                                           Marks : 1/1
```

#### 2. 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
    537
    Answer
    #include <stdio.h>
#include <stdlib.h>
    // Node structure
    typedef struct Node {
      int data;
      struct Node* next;
    } Node;
    Node* head = NULL; // Global head pointer
    // Function to create the linked list
    void createList() {
   int value;
      while (1) {
        scanf("%d", &value);
        if (value == -1) break;
        Node* newNode = (Node*)malloc(sizeof(Node));
        newNode->data = value;
        newNode->next = NULL;
        if (head == NULL) {
          head = newNode;
        } else {
          Node* temp = head;
          while (temp->next != NULL) {
            temp = temp->next; <
          temp->next = newNode;
```

```
printf("LINKED LIST CREATED\n");
// Function to display the linked list
void displayList() {
  if (head == NULL) {
    printf("The list is empty\n");
    return;
  Node* temp = head;
  while (temp != NULL) {
   printf("%d ", temp->data);
    temp = temp->next;
  printf("\n");
// Function to insert at the beginning
void insertAtBeginning(int data) {
  Node* newNode = (Node*)malloc(sizeof(Node));
  newNode->data = data:
  newNode->next = head:
  head = newNode;
  printf("The linked list after insertion at the beginning is:\n");
  displayList();
// Function to insert at the end
void insertAtEnd(int data) {
  Node* newNode = (Node*)malloc(sizeof(Node));
  newNode->data = data:
  newNode->next = NULL;
  if (head == NULL) {
    head = newNode;
  } else {
    Node* temp = head;
    while (temp->next != NULL) {
      temp = temp->next;
    temp->next = newNode;
```

```
printf("The linked list after insertion at the end is:\n");
  displayList();
// Function to insert before a given value
void insertBeforeValue(int value, int data) {
  if (head == NULL) {
    printf("Value not found in the list\n");
    displayList();
    return;
  if (head->data == value) {
   🔨 insertAtBeginning(data);
    return;
  Node* temp = head;
  Node* prev = NULL;
  while (temp != NULL && temp->data != value) {
    prev = temp;
    temp = temp->next;
  if (temp == NULL) {
    printf("Value not found in the list\n");
    displayList();
    return;
  Node* newNode = (Node*)malloc(sizeof(Node));
  newNode->data = data;
  newNode->next = temp;
  prev->next = newNode;
  printf("The linked list after insertion before a value is:\n");
  displayList();
}
// Function to insert after a given value
void insertAfterValue(int value, int data) {
  Node* temp = head;
  while (temp != NULL && temp->data != value) {
   temp = temp->next;
  if (temp == NULL) {
```

```
printf("Value not found in the list\n");
    displayList();
    return;
  Node* newNode = (Node*)malloc(sizeof(Node));
  newNode->data = data;
  newNode->next = temp->next;
  temp->next = newNode;
  printf("The linked list after insertion after a value is:\n");
  displayList();
}
// Function to delete from the beginning
void deleteFromBeginning() {
\if (head == NULL) {
    printf("The list is empty\n");
    return;
  Node* temp = head;
  head = head->next;
  free(temp);
  printf("The linked list after deletion from the beginning is:\n");
  displayList();
}
// Function to delete from the end
void deleteFromEnd() {
oif (head == NULL) {
    printf("The list is empty\n");
    return;
  if (head->next == NULL) {
    free(head);
    head = NULL;
  } else {
    Node* temp = head;
    Node* prev = NULL;
    while (temp->next != NULL) {
       prev = temp;
      temp = temp->next;
    prev->next = NULL;
```

```
free(temp);
  printf("The linked list after deletion from the end is:\n");
  displayList();
// Function to delete before a given value
void deleteBeforeValue(int value) {
  if (head == NULL || head->next == NULL) {
    printf("Value not found in the list\n");
    return;
  if (head->next->data == value) {
   deleteFromBeginning();
    return;
  Node* prev = NULL;
  Node* temp = head;
  Node* beforePrev = NULL;
  while (temp->next != NULL && temp->next->data != value) {
    beforePrev = prev;
    prev = temp;
    temp = temp->next;
  if (temp->next == NULL) {
    printf("Value not found in the list\n");
    return;
  if (beforePrev == NULL) {
    head = temp->next;
  } else {
    beforePrev->next = temp->next;
  }
  free(temp);
  printf("The linked list after deletion before a value is:\n");
  displayList();
```

```
while (temp != NULL && temp->data != value) {
   temp = temp->next;
}
if (temp)
     // Function to delete after a given value
     void deleteAfterValue(int value) {
       if (temp == NULL || temp->next == NULL) {
         printf("Value not found in the list\n");
         return;
       }
       Node* toDelete = temp->next;
       temp->next = toDelete->next;
       free(toDelete);
displayList();
       printf("The linked list after deletion after a value is:\n");
     // Main function
     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:
         return 0:
      default:
         printf("Invalid option! Please try again\n");
    }
  }
  return 0;
                                                                      Marks: 0.4/1
Status: Partially correct
```

#### 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
537
Answer
// You are using GCC
#include <stdio.h>
#include <stdlib.h>
// Structure for a linked list node
typedef struct Node {
  int data:
  struct Node* next;
} Node;
Node* head = NULL; // Global head pointer
// Function to create the linked list
void createList() {
  int value;
  while (1) {
     scanf("%d", &value);
    if (value == -1) break;
     Node* newNode = (Node*)malloc(sizeof(Node));
     newNode->data = value;
     newNode->next = NULL;
    if (head == NULL) {
      head = newNode;
    } else {
       Node* temp = head;
```

```
while (temp->next != NULL) {
             temp = temp->next;
           temp->next = newNode;
      }
      printf("LINKED LIST CREATED\n");
    // Function to display the linked list
    void displayList() {
      if (head == NULL) {
         printf("The list is empty\n");
        return;
      Node* temp = head;
      while (temp != NULL) {
         printf("%d ", temp->data);
         temp = temp->next;
      }
      printf("\n");
    // Function to insert at the beginning
    void insertAtBeginning(int data) {
      Node* newNode = (Node*)malloc(sizeof(Node));
      newNode->data = data;
      newNode->next = head;
      head = newNode;
      printf("The linked list after insertion at the beginning is:\n");
      displayList();
    }
    // Function to insert at the end
    void insertAtEnd(int data) {
      Node* newNode = (Node*)malloc(sizeof(Node));
      newNode->data = data;
      newNode->next = NULL;
      if (head == NULL) {
nead
} else {
N-
       head = newNode;
         Node* temp = head;
```

```
while (temp->next != NULL) {
       temp = temp->next;
    temp->next = newNode;
  printf("The linked list after insertion at the end is:\n");
  displayList();
}
// Function to insert before a specific value
void insertBeforeValue(int value, int data) {
  if (head == NULL) {
    printf("Value not found in the list\n");
    displayList();
    return;
  if (head->data == value) {
    insertAtBeginning(data);
    return;
  }
  Node* temp = head;
  Node* prev = NULL;
  while (temp != NULL && temp->data != value) {
    prev = temp;
    temp = temp->next;
  if (temp == NULL) {
    printf("Value not found in the list\n");
    displayList();
    return;
  Node* newNode = (Node*)malloc(sizeof(Node));
  newNode->data = data:
  newNode->next = temp;
  prev->next = newNode;
  printf("The linked list after insertion before a value is:\n");
  displayList();
}
// Function to insert after a specific value
void insertAfterValue(int value, int data) {
  Node* temp = head;
```

```
while (temp != NULL && temp->data != value) {
    temp = temp->next;
  if (temp == NULL) {
    printf("Value not found in the list\n");
    displayList();
    return;
  Node* newNode = (Node*)malloc(sizeof(Node));
  newNode->data = data:
  newNode->next = temp->next;
  temp->next = newNode;
  printf("The linked list after insertion after a value is:\n");
  displayList();
// Function to delete from the beginning
void deleteFromBeginning() {
  if (head == NULL) {
    printf("The list is empty\n");
    return;
  Node* temp = head;
  head = head->next;
  free(temp);
  printf("The linked list after deletion from the beginning is:\n");
  displayList();
// Function to delete from the end
void deleteFromEnd() {
  if (head == NULL) {
    printf("The list is empty\n");
    return;
  if (head->next == NULL) {
    free(head);
    head = NULL;
  } else {
    Node* temp = head;
    Node* prev = NULL;
    while (temp->next != NULL) {
```

```
prev = temp;
          temp = temp->next;
        prev->next = NULL
        free(temp);
      printf("The linked list after deletion from the end is:\n");
      displayList();
   // Function to delete before a specific value
   void deleteBeforeValue(int value) {
      if (head == NULL || head->next == NULL) {
       printf("Value not found in the list\n");
        return;
      if (head->next->data == value) {
        deleteFromBeginning();
        return;
      }
      Node* prev = NULL;
      Node* temp = head;
      Node* beforePrev = NULL:
      while (temp->next != NULL && temp->next->data != value) {
        beforePrev = prev;
        prev = temp;
        temp = temp->next;
      if (temp->next == NULL) {
        printf("Value not found in the list\n");
        return;
      }
      if (beforePrev == NULL) {
        head = temp->next;
      } else {
        beforePrev->next = temp->next;
free(temp);
```

```
displayList();
       printf("The linked list after deletion before a value is:\n");
                                                       240701
    // Function to delete after a specific value
    void deleteAfterValue(int value) {
       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;
      Node* toDelete = temp->next;
       temp->next = toDelete->next;
       free(toDelete);
       printf("The linked list after deletion after a value is:\n");
       displayList();
    }
    // Main function
    int main() {
       int choice, value, data;
       while (1) {
         scanf("%d", &choice);
         switch (choice) {
             createList(); break
           case 1:
           case 2:
             displayList();
              break;
           case 3:
              scanf("%d", &data);
             insertAtBeginning(data);
              break;
           case 4:
              scanf("%d", &data);
              insertAtEnd(data);
              break:
```

```
24010151 A 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:
              return 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
// You are using GCC
#include <stdio.h>
#include <stdlib.h>
// Structure for a linked list node
typedef struct Node {
int data;
  struct Node* next;
} Node:
// Function to create a new node
Node* createNode(int data) {
  Node* newNode = (Node*)malloc(sizeof(Node));
  newNode->data = data;
  newNode->next = NULL:
  return newNode;
}
// Function to insert at the beginning (for even numbers - reversed order)
void insertAtBeginning(Node** head, int data) {
  Node* newNode = createNode(data);
  newNode->next = *head:
  *head = newNode;
}
// Function to insert at the end (for odd numbers - original order)
void insertAtEnd(Node** head, Node** tail, int data) {
  Node* newNode = createNode(data);
  if (*head == NULL) {
    *head = *tail = newNode;
  } else {
  (*tail)->next = newNode;
    *tail = newNode;
```

```
// Function to display the linked list
void displayList(Node* head) {
  while (head != NULL) {
    printf("%d ", head->data);
    head = head->next:
  printf("\n");
// Main function
int main() {
  int n, value;
 Node* evenHead = NULL; // Head of reversed even list
  Node* oddHead = NULL; // Head of odd list
  Node* oddTail = NULL; // Tail of odd list
  // Read input size
  scanf("%d", &n);
  // Read elements and process them
  for (int i = 0; i < n; i++) {
    scanf("%d", &value);
    if (value % 2 == 0) {
      insertAtBeginning(&evenHead, value); // Reverse even numbers
      insertAtEnd(&oddHead, &oddTail, value); // Maintain odd order
  // Print the rearranged list
  displayList(evenHead); // Print reversed even numbers first
  displayList(oddHead); // Print odd numbers in original order
  return 0;
Status: Correct
                                                                       Marks: 1/1
```

5. 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.

040101514

0,101015111

2,40701514

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
1013
    12
    11
    1
    Output: 36
    Answer
    #include <stdio.h>
    #include <stdlib.h>
    // Define Node structure
   typedef struct Node {
   int coefficient;
      struct Node* next;
   } Node:
    // Function to create a new node
    Node* createNode(int coefficient) {
      Node* newNode = (Node*)malloc(sizeof(Node));
      newNode->coefficient = coefficient;
      newNode->next = NULL;
      return newNode;
   }
    // Function to insert a node at the end
   void insertAtEnd(Node** head, int coefficient) {
      Node* newNode = createNode(coefficient);
```

```
if (*head == NULL) {
    *head = newNode;
    return;
  Node* temp = *head;
  while (temp->next != NULL) {
    temp = temp->next;
  temp->next = newNode;
}
// Function to compute power (x^exp) without overflow
long long power(int base, int exp) {
  long long result = 1;
for (int i = 0; i < exp; i++) {
    result *= base;
  return result;
// Function to evaluate the polynomial
long long evaluatePolynomial(Node* head, int x, int degree) {
  long long result = 0;
  Node* temp = head;
  while (temp != NULL) {
    result += (long long) temp->coefficient * power(x, degree);
    temp = temp->next;
    degree--;
  return result;
// Main function
int main() {
  Node* head = NULL;
  int degree, coefficient, x;
  // Read degree of polynomial
  scanf("%d", &degree);
 // Read coefficients and insert them into the linked list
  for (int i = 0; i \le degree; i++) {
```

```
scanf("%d", &coefficient);
insertAtEnd(&head, coefficient);
}

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

// Compute and print the polynomial evaluation result
printf("%lld\n", evaluatePolynomial(head, x, degree));

return 0;
}

Status: Correct

Marks: 1/1
```