Q1. Write a C program to add 2 polynomials which are represented using linked list and store the result in the resultant linked list.

CODE:

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

void info() {
  printf("*****************************************************\n");
  printf("Name: Dhruva Narayan K\n");
  printf("BT ID.: BT23CSE016\n");
  time_t currentTime;
  time(&currentTime);
  struct tm *localTime = localtime(&currentTime);
  printf("Current local time: %s", asctime(localTime));
}

struct node
{
    int coef;
    int exp;
    struct node *next;
};
struct node *insert(struct node *head, int ex, int co)
{
    struct node *temp;
    struct node *newp = malloc(sizeof(struct node));
    newp->exp = ex;
    newp->coef = co;
    newp->next = NULL;
    if (head == NULL || ex > head->exp)
    {
        newp->next = head;
        head = newp;
    }
    else
    {
        temp = head;
        while (temp->next != NULL && temp->next->exp >= ex)
        {
            temp = temp->next;
        }
        newp->next = temp->next;
        temp->next = newp;
    }
```

```
    return head;
}
struct node *create(struct node *head)
{
    int n;
    int exp, coef;

    printf("Enter the number of terms in the polynomial: ");
    scanf("%d", &n);
    for (int i = 0; i < n; i++)
    {
        printf("Enter the exponent and coefficient of term %d: ", i +
1);
        scanf("%d %d", &exp, &coef);
        head = insert(head, exp, coef);
    }
    return head;
}
void display(struct node *head)
{
    struct node *temp = head;
    while (temp != NULL)
    {
        printf("%dx^%d", temp->coef, temp->exp);
        temp = temp->next;
        if (temp != NULL)
        {
            printf("+");
        }
    }
    printf("\n");
}
void add(struct node *head1, struct node *head2)
{
    struct node *temp1 = head1;
    struct node *temp2 = head2;
    struct node *head3 = NULL;
    while (temp1 != NULL && temp2 != NULL)
    {
        if (temp1->exp == temp2->exp)
        {
            head3 = insert(head3, temp1->exp, temp1->coef + temp2-
>coef);
            temp1 = temp1->next;
            temp2 = temp2->next;
        }
```

```
        else if (temp1->exp > temp2->exp)
        {
            head3 = insert(head3, temp1->exp, temp1->coef);
            temp1 = temp1->next;
        }
        else
        {
            head3 = insert(head3, temp2->exp, temp2->coef);
            temp2 = temp2->next;
        }
    }
    while (temp1 != NULL)
    {
        head3 = insert(head3, temp1->exp, temp1->coef);
        temp1 = temp1->next;
    }
    while (temp2 != NULL)
    {
        head3 = insert(head3, temp2->exp, temp2->coef);
        temp2 = temp2->next;
    }
    display(head3);
}
int main()
{
    struct node *head1 = NULL;
    struct node *head2 = NULL;
    printf("Enter the first polynomial \n");
    printf("-------------------------- \n");
    head1 = create(head1);
    printf("Enter the second polynomial \n");
    printf("-------------------------- \n");
    head2 = create(head2);
    printf("The first polynomial is: ");
    display(head1);
    printf("The second polynomial is: ");
    display(head2);
    printf("The sum of the two polynomials is: ");
    add(head1, head2);
    info();
    return 0;
}
```

OUTPUT:

```
Enter the first polynomial
------------------------
Enter the number of terms in the polynomial: 4
Enter the exponent and coefficient of term 1: 4 3
Enter the exponent and coefficient of term 2: 5 2
Enter the exponent and coefficient of term 3: 3 1
Enter the exponent and coefficient of term 4: 0 9
Enter the second polynomial
------------------------
Enter the number of terms in the polynomial: 3
Enter the exponent and coefficient of term 1: 4 1
Enter the exponent and coefficient of term 2: 2 2
Enter the exponent and coefficient of term 3: 0 1
The first polynomial is: 2x^5+3x^4+1x^3+9x^0
The second polynomial is: 1x^4+2x^2+1x^0
The sum of the two polynomials is: 2x^5+4x^4+1x^3+2x^2+10x^0
**************************************************
Name: Dhruva Narayan K
BT ID.: BT23CSE016
Current local time: Sat Aug 10 11:31:43 2024
```

Q2. Write a C program to multiply 2 polynomials which are represented using linked list and store result in the resultant linked list.

CODE:

```c
#include <stdio.h>
#include <stdlib.h>
#include <time.h>
void info()
{
    printf("**************************************************\n");
    printf("Name: Dhruva Narayan K\n");
    printf("BT ID.: BT23CSE016\n");
    time_t currentTime;
    time(&currentTime);
    struct tm *localTime = localtime(&currentTime);
    printf("Current local time: %s", asctime(localTime));
}
struct node
{
    int coef;
    int exp;
    struct node *next;
};
struct node *insert(struct node *head, int ex, int co)
{
    struct node *temp;
    struct node *newp = malloc(sizeof(struct node));
    newp->exp = ex;
    newp->coef = co;
```

```
    newp->next = NULL;
    if (head == NULL || ex > head->exp)
    {
        newp->next = head;
        head = newp;
    }
    else
    {
        temp = head;
        while (temp->next != NULL && temp->next->exp >= ex)
        {
            temp = temp->next;
        }
        newp->next = temp->next;
        temp->next = newp;
    }
    return head;
}
struct node *create(struct node *head)
{
    int n;
    int exp, coef;

    printf("Enter the number of terms in the polynomial: ");
    scanf("%d", &n);
    for (int i = 0; i < n; i++)
    {
        printf("Enter the exponent and coefficient of term %d: ", i +
1);
        scanf("%d %d", &exp, &coef);
        head = insert(head, exp, coef);
    }
    return head;
}
void display(struct node *head)
{
    struct node *temp = head;
    while (temp != NULL)
    {
        printf("%dx^%d", temp->coef, temp->exp);
        temp = temp->next;
        if (temp != NULL)
        {
            printf("+");
        }
    }
```

```
    printf("\n");
}
void poly_mul(struct node *head1, struct node *head2)
{
    struct node *temp1 = head1;
    struct node *temp2 = head2;
    struct node *head3 = NULL;

    while (temp1 != NULL)
    {
        temp2 = head2;
        while (temp2 != NULL)
        {
            head3 = insert(head3, temp1->exp + temp2->exp, temp1->coef
* temp2->coef);
            temp2 = temp2->next;
        }
        temp1 = temp1->next;
    }

    struct node *temp3 = head3;
    while (temp3 != NULL && temp3->next != NULL)
    {
        struct node *current = temp3;
        while (current->next != NULL)
        {
            if (temp3->exp == current->next->exp)
            {
                temp3->coef += current->next->coef;
                struct node *temp4 = current->next;
                current->next = current->next->next;
                free(temp4);
            }
            else
            {
                current = current->next;
            }
        }
        temp3 = temp3->next;
    }

    display(head3);
}

int main()
{
```

```
    struct node *head1 = NULL;
    struct node *head2 = NULL;
    head1 = create(head1);
    head2 = create(head2);
    printf("The first polynomial is: ");
    display(head1);
    printf("The second polynomial is: ");
    display(head2);
    printf("The product of the two polynomials is: ");
    poly_mul(head1, head2);
    info();
    return 0;
}
```

OUTPUT:

```
Enter the number of terms in the polynomial: 3
Enter the exponent and coefficient of term 1: 2 1
Enter the exponent and coefficient of term 2: 4 2
Enter the exponent and coefficient of term 3: 1 1
Enter the number of terms in the polynomial: 2
Enter the exponent and coefficient of term 1: 3 2
Enter the exponent and coefficient of term 2: 0 1
The first polynomial is: 2x^4+1x^2+1x^1
The second polynomial is: 2x^3+1x^0
The product of the two polynomials is: 4x^7+2x^5+4x^4+1x^2+1x^1
**************************************************
Name: Dhruva Narayan K
BT ID.: BT23CSE016
Current local time: Sat Aug 10 12:00:15 2024
```

Q3. Write a C program to add two polynomials where for the first polynomial is required to be represented using a linked list. For the 2nd polynomial instead of creating a new linked list, add coefficients as soon as you get it as an input from the user. (In this entire process you will create only one linked list for two polynomials and for result also)

CODE:

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

void info()
{
    printf("**************************************************\n");
```

```c
    printf("Name: Dhruva Narayan K\n");
    printf("BT ID.: BT23CSE016\n");
    time_t currentTime;
    time(&currentTime);
    struct tm *localTime = localtime(&currentTime);
    printf("Current local time: %s", asctime(localTime));
}

struct node
{
    int coef;
    int exp;
    struct node *next;
};

struct node *insert(struct node *head, int ex, int co)
{
    struct node *temp;
    struct node *newp = malloc(sizeof(struct node));
    newp->exp = ex;
    newp->coef = co;
    newp->next = NULL;
    if (head == NULL || ex > head->exp)
    {
        newp->next = head;
        head = newp;
    }
    else
    {
        temp = head;
        while (temp->next != NULL && temp->next->exp >= ex)
        {
            temp = temp->next;
        }
        newp->next = temp->next;
        temp->next = newp;
    }
    return head;
}

struct node *create(struct node *head)
{
    int n, exp, coef;
    printf("Enter the number of terms in the first polynomial: ");
    scanf("%d", &n);
    for (int i = 0; i < n; i++)
```

```
    {
        printf("Enter the exponent and coefficient of term %d: ", i +
1);
        scanf("%d %d", &exp, &coef);
        head = insert(head, exp, coef);
    }
    return head;
}
void add(struct node *head)
{
    int n, exp, coef;
    struct node *temp;
    printf("Enter the number of terms in the second polynomial: ");
    scanf("%d", &n);
    for (int i = 0; i < n; i++)
    {
        printf("Enter the exponent and coefficient of term %d: ", i +
1);
        scanf("%d %d", &exp, &coef);
        temp = head;
        while (temp != NULL && temp->exp != exp)
        {
            temp = temp->next;
        }
        if (temp != NULL)
        {
            temp->coef += coef;
        }
        else
        {
            head = insert(head, exp, coef);
        }
    }
    printf("The sum of the two polynomials is: ");
    display(head);
}

void display(struct node *head)
{
    struct node *temp = head;
    while (temp != NULL)
    {
        printf("%dx^%d", temp->coef, temp->exp);
        temp = temp->next;
        if (temp != NULL)
        {
```

```
            printf(" + ");
        }
    }
    printf("\n");
}

int main()
{
    struct node *head = NULL;
    head = create(head);
    printf("The first polynomial is: ");
    display(head);
    add(head);
    info();
    return 0;
}
```

OUTPUT:

```
Enter the number of terms in the first polynomial: 3
Enter the exponent and coefficient of term 1: 2 1
Enter the exponent and coefficient of term 2: 1 1
Enter the exponent and coefficient of term 3: 0 5
The first polynomial is: 1x^2 + 1x^1 + 5x^0
Enter the number of terms in the second polynomial: 3
Enter the exponent and coefficient of term 1: 2 2
Enter the exponent and coefficient of term 2: 1 0
Enter the exponent and coefficient of term 3: 0 3
The sum of the two polynomials is: 3x^2 + 1x^1 + 8x^0
**********************************************************
Name: Dhruva Narayan K
BT ID.: BT23CSE016
Current local time: Sat Aug 10 12:59:53 2024
```