**SSN COLLEGE OF ENGINEERING (Autonomous)**

**Affiliated to Anna University**

**DEPARTMENT OF CSE**

**UCS 1312 Data Structures Lab Laboratory**

**EX3:POLYNOMIAL MANIPULATION USING LINKED LIST**

**=====================================================================================REGISTRATION NO: 185001112**

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**CLASS: CSE-B (SEMESTER-3)**

**=====================================================================================Aim:**

To Create two linked list for the following polynomial equations

1. 3x12 + 8x8 – 22x4 +3x -7

2. 7x14 -10x9 – 8x8 +6x5-9x

Perform the following operations using a menu driven program

1. Create linked list for the polynomials

2. Polynomial addition by passing two polynomial lists as arguments and return

the resultant polynomial list

3. Polynomial multiplication by passing two polynomial lists as arguments and

return the resultant polynomial list

4. Display the given polynomials and the resultant polynomial.

**Note:**

To maintain 3 files.

1. Structure and function definitions – **function.h**

2. Function prototypes – **prototype.h**

3. Application – **main.c**

**Source Code:**

**1) function.h**

#include<stdio.h>

#include<stdlib.h>

typedef struct mynode

{

int exp,coeff;

struct mynode \*next;

}node;

node \* createlist()

{

node \* h=malloc(sizeof(node));

h->next=NULL;

return h;

}

void getpolynomial(node \* head)

{

int n;

node \* temp=head;

printf("\nEnter number of terms in the polynomial: \n");

scanf("%d",&n);

for(int i=0;i<n;i++)

{

node \* nptr=malloc(sizeof(node));

printf("Enter Exponent of term %d: \n",i+1);

scanf("%d",&nptr->exp);

printf("Enter Coefficient of x^%d: \n",nptr->exp);

scanf("%d",&nptr->coeff);

nptr->next=NULL;

temp->next=nptr;

temp=nptr;

}

}

void output(node \* head)

{

node \* temp=head->next;

while(temp!=NULL)

{

if(temp->exp!=0&&temp->coeff!=0){

printf(" %+dx^%d",temp->coeff,temp->exp);

}

else if(temp->exp!=0){

printf(" %+d",temp->coeff);

}

temp=temp->next;

}

printf("\n");

}

void add(node \* h1,node \* h2,node \*res)

{

node \*t1,\*t2,\*t3;

t1=h1->next;

t2=h2->next;

t3=res;

while(t1!=NULL&&t2!=NULL)

{

node \*nptr=malloc(sizeof(node));

if(t1->exp==t2->exp)

{

if(t1->coeff+t2->coeff!=0){

nptr->coeff=t1->coeff+t2->coeff;

nptr->exp=t1->exp;

}

t1=t1->next;

t2=t2->next;

}

else if(t1->exp>t2->exp)

{

nptr->coeff=t1->coeff;

nptr->exp=t1->exp;

t1=t1->next;

}

else

{

nptr->coeff=t2->coeff;

nptr->exp=t2->exp;

t2=t2->next;

}

nptr->next=NULL;

t3->next=nptr;

t3=nptr;

}

while(t1!=NULL)

{

node \*nptr=malloc(sizeof(node));

nptr->coeff=t1->coeff;

nptr->exp=t1->exp;

t1=t1->next;

nptr->next=NULL;

t3->next=nptr;

t3=nptr;

}

while(t2!=NULL)

{

node \*nptr=malloc(sizeof(node));

nptr->coeff=t2->coeff;

nptr->exp=t2->exp;

t2=t2->next;

nptr->next=NULL;

t3->next=nptr;

t3=nptr;

}

}

void multipy(node \* h1,node \* h2,node \*res)

{

node \*t1,\*t2,\*t3,\*t4;

t2=h2->next;

t3=res;

if(h1==NULL || h2==NULL)

{

printf("Multiplied polynomial is zero polynomial\n");

return;

}

while(t2!=NULL)

{

node \* temp=createlist();

t4=temp;

t1=h1->next;

while(t1!=NULL)

{

node \* nptr=malloc(sizeof(node));

nptr->coeff=t2->coeff\*t1->coeff;

nptr->exp=t2->exp+t1->exp;

nptr->next=NULL;

t4->next=nptr;

t4=nptr;

t1=t1->next;

}

output(temp);

add(res,temp,res);

t2=t2->next;

}

}

**2) prototype.h**

#include"functions.h"

node \* createlist();

void getpolynomial(node \* head);

void output(node \* head);

void add(node \* h1,node \* h2,node \*res);

void multipy(node \* h1,node \* h2,node \*res);

**3) main.c**

#include"prototypes.h"

int main()

{

node \* head1,\*head2;

head1=createlist();

int op;

printf("Enter Polynomial 1: \n");

getpolynomial(head1);

printf("\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\n");

head2=createlist();

printf("Enter Polynomial 2: \n");

getpolynomial(head2);

printf("\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\n");

do

{

printf("\nMenu\n1.Add polynomials \n2.Multipy polynomials \n3.Exit");

printf("\nEnter your choice: ");

scanf(" %d",&op);

if(op==1)

{

node \* res;

res=createlist();

printf("\n\nPolynomial 1: ");

output(head1);

printf("\n\nPolynomial 2: ");

output(head2);

add(head1,head2,res);

printf("\n\n\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*");

printf("\n\nAddition Result: ");

output(res);

}

else if(op==2)

{

node \* res;

res=createlist();

printf("\n\nPolynomial 1: ");

output(head1);

printf("\n\nPolynomial 2: ");

output(head2);

printf("\n\nMultipicaltion Result: ");

multipy(head1,head2,res);

printf("\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\n");

output(res);

}

else if(op==3)

{

printf("\nThank you!!! \n");

}

else

{

printf("\nInvalid choice\n");

}

}while(op!=3);

return 0;

}

**Output:**

gml36:Desktop cseb64$ gcc polynomial.c -o poly

gml36:Desktop cseb64$ ./poly

Enter Polynomial 1:

Enter number of terms in the polynomial:

5

Enter Exponent of term 1:

12

Enter Coefficient of x^12:

3

Enter Exponent of term 2:

8

Enter Coefficient of x^8:

8

Enter Exponent of term 3:

4

Enter Coefficient of x^4:

-22

Enter Exponent of term 4:

1

Enter Coefficient of x^1:

3

Enter Exponent of term 5:

0

Enter Coefficient of x^0:

-7

\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

Enter Polynomial 2:

Enter number of terms in the polynomial:

5

Enter Exponent of term 1:

14

Enter Coefficient of x^14:

7

Enter Exponent of term 2:

9

Enter Coefficient of x^9:

-10

Enter Exponent of term 3:

8

Enter Coefficient of x^8:

-8

Enter Exponent of term 4:

5

Enter Coefficient of x^5:

6

Enter Exponent of term 5:

1

Enter Coefficient of x^1:

-9

\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

Menu

1.Add polynomials

2.Multipy polynomials

3.Exit

Enter your choice: 1

Polynomial 1: +3x^12 +8x^8 -22x^4 +3x^1

Polynomial 2: +7x^14 -10x^9 -8x^8 +6x^5 -9x^1

\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

Addition Result: +7x^14 +3x^12 -10x^9 +6x^5 -22x^4 -6x^1

Menu

1.Add polynomials

2.Multipy polynomials

3.Exit

Enter your choice: 2

Polynomial 1: +3x^12 +8x^8 -22x^4 +3x^1

Polynomial 2: +7x^14 -10x^9 -8x^8 +6x^5 -9x^1

Multipicaltion Result: +21x^26 +56x^22 -154x^18 +21x^15 -49x^14

-30x^21 -80x^17 +220x^13 -30x^10 +70x^9

-24x^20 -64x^16 +176x^12 -24x^9 +56x^8

+18x^17 +48x^13 -132x^9 +18x^6 -42x^5

-27x^13 -72x^9 +198x^5 -27x^2 +63x^1

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+21x^26 +56x^22 -30x^21 -24x^20 -154x^18 -62x^17 -64x^16 +21x^15 -49x^14 +241x^13 +176x^12 -30x^10 -158x^9 +56x^8 +18x^6 +156x^5 -27x^2 +63x^1

Menu

1.Add polynomials

2.Multipy polynomials

3.Exit

Enter your choice: 3

Thank you!!!