Indian Institute of Engineering Science and Technology, Shibpur Department of Information Technology

Data Structure Laboratory 2021

Assignment – 1

BATCH: HY

Tathagata Ghosh --- 2020ITB065

```c
/*Data Structure Lab Assignment 2021
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07/09/2021*/

/*Q1.Write a program in C to find the third largest from the given array of in
tegers without
sorting.*/

#include<stdio.h>
#include<limits.h>

int main()
{
    printf("Enter the size of the array : ");
    int n;
    scanf( "%d",&n );
    int a[n];
    printf("Enter the elements of the array : \n");
    if(n<=2)
    {
        printf("--Invalid Input--");
        return 0;
    }
    for(int i=0 ; i<n ; i++ )
    {
        scanf("%d",&a[i]);
    }
    printf("The Array : \n");
    for(int i=0 ; i<n ; i++ )
    {
        printf("%d\n",a[i]);
    }
    printf("---------------\n");
    int x , y , z;
    x = y = z = INT_MIN ;
    for(int i=0 ; i<n ; i++ )
    {
        if(x<a[i])
        {
            z=y;
```

```
            y=x;
            x=a[i];
        }
        else if(y<a[i] && a[i]<x)
        {
            z=y;
            y=a[i];
        }
        else if(z<a[i] && a[i]<y)
        {
            z=a[i];
        }
    }
    printf("The 3rd highest element in the array : %d.\n", z );
    return 0;
}
```

OUTPUT :-

Enter the size of the array : 6

Enter the elements of the array :

5

4

8

6

1

5

The Array :

5

4

8

6

1

5

The 3rd highest element in the array : 5.

```
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/*Q2.Given an array of n integers, write a C program for reversing the content
s of the array
without using another array.*/

#include<stdio.h>

int main()
{
    printf("Enter the size of the array : ");
    int n;
    scanf( "%d",&n );
    int a[n];
    printf("Enter the elements of the array : \n");
    for(int i=0 ; i<n ; i++ )
    {
        scanf("%d",&a[i]);
    }
    printf("The Array : \n");
    for(int i=0 ; i<n ; i++ )
    {
        printf("%d\n",a[i]);
    }
    printf("---------------\n");
    for(int i=0 , j=n-1 ; i<j ; i++ , j--)
    {
        int t = a[i];
        a[i] = a[j];
        a[j] = t;
    }
    printf("The Reversed Array : \n");
    for(int i=0 ; i<n ; i++ )
    {
        printf("%d\n",a[i]);
    }
    return 0;
}
```

OUTPUT :-

Enter the size of the array : 10

Enter the elements of the array :

1

5

9

7

4

9

6

3

2

1

The Array :

1

5

9

7

4

9

6

3

2

1

The Reversed Array :

1

2

3

6

9

4

7

9

5

1

```
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/*Q3.Write a C program to add and subtract two integers having at least 10 dig
its each.*/

#include <stdio.h>

void add(int n1, int n2, int n, int num1[], int num2[])
{
    int sum[n + 1];
    int car = 0;
    for (int i = n - 1; i >= 0; i--)
    {
        int digSum = num1[i] + num2[i] + car;
        car = digSum / 10;
        int dig = digSum % 10;
        sum[i + 1] = dig;
    }
    sum[0] = car;
    printf("Sum of the numbers is: \n");
    for (int i = 0; i <= n; i++)
    {
        printf("%d", sum[i]);
    }
    printf("\n");
}

void sub(int n1, int n2, int n, int num1[], int num2[])
{
    int dif[n + 1];
    int car = 0;
    for (int i = n - 1; i >= 0; i--)
    {
        int digDif = num1[i] - num2[i] - car;
        if (digDif < 0)
        {
            car = 1;
            digDif += 10;
        }
        else
        {
            car = 0;
        }
        dif[i + 1] = digDif;
    }
    dif[0] = car;
```

```
    for (int i = 1; i <= n; i++)
    {
        printf("%d", dif[i]);
    }
    printf("\n");
}

int main()
{
    int n1;
    printf("-----------------------------------------\n");
    printf("Enter the number of digits in first number:\n");
    printf("-----------------------------------------\n");
    scanf("%d", &n1);
    int n2;
    printf("-----------------------------------------\n");
    printf("Enter the number of digits in second number:\n");
    printf("-----------------------------------------\n");
    scanf("%d", &n2);
    int n = n1 > n2 ? n1 : n2;
    int num1[n];
    int num2[n];

    printf("-------------------------------------------------------------\n");
    printf("Enter the first number, each digits being space separated:\n");
    printf("-------------------------------------------------------------\n");
    for (int i = 0; i < n; i++)
    {
        if (i >= n - n1) {
            int x;
            scanf("%d", &x);
            num1[i] = x;
        }
        else
            num1[i] = 0;

    }
    printf("-------------------------------------------------------------\n");
    printf("Enter the second number, each digits being space separated:\n");
    printf("-------------------------------------------------------------\n");
    for (int i = 0; i < n; i++)
    {
        if (i >= n - n2)
        {
            int x;
            scanf("%d", &x);
            num2[i] = x;
        }
```

```
        else
            num2[i] = 0;
    }
    printf("----------------------------------\n");
    printf("Enter 1 to add and 2 to subtract:\n");
    printf("----------------------------------\n");
    int ch;
    scanf("%d", &ch);
    if (ch == 1)
    {
        add(n1, n2, n, num1, num2);
    }
    else if (ch == 2)
    {
        for (int i = 0; i < n; i++)
        {
            if (num1[i] > num2[i])
            {
                printf("-----------------------------\n");
                printf("Difference of the numbers is: \n");
                printf("-----------------------------\n");
                sub(n1, n2, n, num1, num2);
                break;
            }
            else if (num2[i] > num1[i])
            {
                printf("-");
                sub(n2, n1, n, num2, num1);
                break;
            }
        }
    }
    else
        printf("Enter a valid choice");
    return 0;
}
```

OUTPUT :-

1.

Enter the number of digits in first number:

10

Enter the number of digits in second number:

11

Enter the first number, each digits being space separated:

---

1 2 3 6 4 8 9 7 5 5

Enter the second number, each digits being space separated:

---

5 4 1 2 6 3 8 7 4 5 2

Enter 1 to add and 2 to subtract:

1

Sum of the numbers is:

055362877207

2.

Enter the number of digits in first number:

11

Enter the number of digits in second number:

12

Enter the first number, each digits being space separated:

---

8 4 5 2 1 4 6 9 8 5 8

Enter the second number, each digits being space separated:

---

7 8 5 4 1 9 6 5 4 1 2 0

Enter 1 to add and 2 to subtract:

2

-700898184262

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/*Q4. Write a C program to find the frequency of a character present in the te
xt given in a file.*/

#include <stdio.h>

int main()
{
    char s[5000];
    int cnt = 0;
    char ch;
    printf("Enter the string:\n");
    gets(s);
    printf("Enter the character whose frequency is to be found: \n");
    scanf("%c", &ch);
    int i = 0;
    while (s[i] != '\0')
    {
        char x;
        x = s[i];
        if (ch == x)
            cnt++;
        i++;
    }
    printf("Frequency of ' %c '   : %d \n", ch, cnt);
}
```

OUTPUT :-

Enter the string:

My name is Tathagata Ghosh.

Enter the character whose frequency is to be found:

a

Frequency of ' a ' : 5

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/*Q5. Write a program in C to store a sparse matrix of order n x n efficiently
 which will take
less space than the normal way of storing a matrix.*/

#include <stdio.h>

int main()
{
    int n;
    printf("Enter the dimension of sparse matrix: ");
    scanf("%d", &n);
    int arr[n][n];
    int nonzero = 0;

    printf("Enter the elements of sparse matrix: \n");
    for (int i = 0; i < n; i++)
    {
        for (int j = 0; j < n; j++)
        {
            scanf("%d", &arr[i][j]);
            if (arr[i][j] != 0)
            {
                nonzero++;
            }
        }
    }

    int sparse[nonzero][3];
    int k = 0;
    for (int i = 0; i < n; i++)
    {
        for (int j = 0; j < n; j++)
        {
            if (arr[i][j] != 0)
            {
                sparse[k][0] = i;
                sparse[k][1] = j;
                sparse[k][2] = arr[i][j];
                k++;
            }
```

```
            if (k == nonzero) {
                break;
            }
        }
    }

    printf("row\tcol\tvalue\n");
    for (int i = 0; i < nonzero; i++)
    {
        printf("%d\t%d\t%d\n", sparse[i][0], sparse[i][1], sparse[i][2]);
    }
}
```

OUTPUT :-

Enter the dimension of sparse matrix: 4

Enter the elements of sparse matrix:

0 0 0 1

0 0 4 0

0 0 0 0

5 0 0 0

row col value

0 3 1

1 2 4

3 0 5

Github :- https://github.com/Tathagata-Ghosh-Developer/Lab-Assignment-3rd-Semester