

Data structure & Algorithms

Assignment-2 (Structure and Dynamic Array)

BTech

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Lab Assignment: 02

1. Write a program in C to reverse the contents of a dynamic array of n elements.

Code:-

```
#include<stdio.h>

#include<stdlib.h>

int main(){
    int n;
    printf("Enter the number of elements:-");
    scanf("%d",&n);
    int *arr = (int*)calloc(n,sizeof(int));
    printf("Enter all the elements speparated by space:- ");
    for(int i=0;i<n;i++) scanf("%d",&arr[i]);

    int last = n-1;
    for (int j=0;j<n/2;j++){
        int temp = arr[j];
        arr[j] = arr[last];
        arr[last] = temp;
        last--;
    }

    printf("Reversed array is:- ");
    for(int i=0;i<n;i++) printf("%d ",arr[i]);
}
```

Output:-

```
Enter the number of elements:-5
Enter all the elements speparated by space:- 1 2 3 4 5
Reversed array is:- 5 4 3 2 1
```

2. Given an unsorted dynamic array of size n , WAP to find and display the number of elements between two elements a and b (both inclusive).

Sample Input:

$arr = [1, 2, 2, 7, 5, 4], a = 2 \text{ and } b = 5,$

Sample Output:

4 and the numbers are: 2, 2, 5, 4.

Code:-

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

int main(){
    int n;
    printf("Enter the number of elements:-");
    scanf("%d",&n);
    int *arr = (int*)calloc(n,sizeof(int));
    printf("Enter all the elements speparated by space:- ");
    for(int i=0;i<n;i++) scanf("%d",&arr[i]);
    int search1,search2;
    printf("Enter starting ending elemnts:- ");
    scanf("%d %d",&search1,&search2);
    printf("Elements between %d and %d are ",search1,search2);
    for(int j=0;j<n;j++){
        if (arr[j]>=search1 && arr[j]<=search2) printf("%d,",arr[j]);
    }
}
```

Output:-

```
Enter the number of elements:-5
Enter all the elements speparated by space:- 1 2 3 4 5
Enter starting ending elemnts:- 1 5
Elements between 1 and 5 are 1,2,3,4,5,
```

3. Given a dynamic array, WAP to print the *next greater element (NGE)* for every element. The next greater element for an element x is the first greater element on the right side of x in array. Elements for which no greater element exist, consider next greater element as - 1.

Sample Input:

Enter the input of an array = [2,5,3,9,7],

Sample Output:

The next greater elements for each elements are as follows.

<i>Element</i>	<i>NGE</i>
2	5
5	9

3	9
9	-1
7	-1

Code:-

```
#include <stdio.h>
#include<stdlib.h>
int main()
{
    int n;
    printf("Enter the number of elements:-");
    scanf("%d", &n);
    int *arr = (int*)calloc(n,sizeof(int));
    printf("Enter all the elements speparated by space:- ");
    for (int i = 0; i < n; i++)
        scanf("%d", &arr[i]);
    printf("Element | NGE\n");
    int nge, i, j;
    for (i = 0; i < n; i++)
    {
        nge = -1;
        for (j = i + 1; j < n; j++)
        {
            if (arr[i] < arr[j])
            {
                nge = arr[j];
                break;
            }
        }
        printf("%d\t -- %d \n", arr[i], nge);
    }
}
```

Output:-

```
Enter the number of elements:-5
Enter all the elements speparated by space:- 2 3 6 9 7
Element | NGE
2      -- 3
3      -- 6
6      -- 9
9      -- -1
7      -- -1
```

- Write a program in C to store n employee's data such as employee name, gender, designation, department, basic pay. Calculate the gross pay of each employees as follows:

$$\text{Gross pay} = \text{basic pay} + \text{HR} + \text{DA}$$

HR=25% of basic and DA=75% of basic.

Code:-

```
#include<stdio.h>

struct kmm{
    float km;
    float m;
};

void convert(struct kmm* b){
    printf("The total distance in km is %.2f\n",b->km+(b->m/1000));
    printf("The total distance in meter is %.2f\n",b->m+(1000*b->km));
}

int main(){
    struct kmm a;
    printf("Enter the distance in km:- ");
    scanf("%f",&a.km);
    printf("Enter the distance in m:- ");
    scanf("%f",&a.m);
    convert(&a);
}
```

Output:-

```
Enter the distance in km:- 5
Enter the distance in m:- 2500
The total distance in km is 7.50
The total distance in meter is 7500.00
```

5. Write a program in C to add two distances (in km-meter) by passing structure to a function.

Code:-

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

struct emp{
    char name[20];
    char gender[5];
    char designation[20];
    char department[20];
    float basic;
    float gross;
```

```

};

void display(struct emp *st,int n){
    int i;
    for(i=0;i<n;i++){
        printf("Details of employee %d\n",i+1);
        printf("Name:- %s \n",st[i].name);
        printf("Gender:- %s\n",st[i].gender);
        printf("Designation:- %s\n",st[i].designation);
        printf("Department:- %s\n",st[i].department);
        printf("Basic Salary:- %.2f\n",st[i].basic);
        printf("Gross Salary:- %.2f\n",st[i].gross);
        printf("\n");
    }
}

int main(){
    int n;
    printf("Enter the number of employees:- ");
    scanf("%d",&n);
    struct emp* data = (struct emp*)malloc(n*sizeof(struct emp));

    for(int i=0;i<n;i++){
        printf("Details for employee %d!\n",i+1);
        printf("Enter the name:- ");
        scanf("%s",data[i].name);
        printf("Enter M or F:- ");
        scanf("%s",data[i].gender);
        printf("Enter the designation:- ");
        scanf("%s",data[i].designation);
        printf("Enter the department:- ");
        scanf("%s",data[i].department);
        printf("Enter the basic pay:- ");
        scanf("%f",&data[i].basic);
        data[i].gross =
data[i].basic+(data[i].basic*0.25)+(data[i].basic*0.75);
    }
    display(data,n);
}

```

Output:-

Enter the number of employees:- 2

Details *for* employee 1!

```
Enter the name:- Aditya
Enter M or F:- M
Enter the designation:- Leader
Enter the department:- Tech
Gross Salary:- 20000000.00
```

```
Details of employee 2
Name:- XYZ
Gender:- F
Designation:- Manager
Department:- Tech
Basic Salary:- 10000.00
Gross Salary:- 20000.00
```

6. Let A be $n \times n$ square dynamic matrix. WAP by using appropriate user defined functions for the following:
- Find the number of nonzero elements in A
 - Find the sum of the elements above the leading diagonal.
 - Swap the major diagonal element to the minor diagonal element.

Code:-

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

void non_zero(int n,int **p){
    int count = 0;
    for(int i=0;i<n;i++){
        for(int j=0;j<n;j++){
            if (p[i][j]==0) count++;
        }
    }
    printf("Number of non-zero elements is %d\n",count);
}

void sum_udia(int n,int **p){
    int sum = 0;
    for(int i=0;i<n;i++){
        for(int j=0;j<n;j++){
            if (j>i) sum+=*(p+i)+j);
        }
    }
    printf("Sum of the elements above major diagonal is %d\n",sum);
}

void swap_major_minor(int n,int** arr){
```

```

    int j,temp;
    for(int i=0;i<n;i++){
        j = i;
        temp = (*(arr+i)+j);
        (*(arr+i)+j) = (*(arr+i)+(n-j-1));
        (*(arr+i)+(n-j-1)) = temp;
    }
}

void print_mat(int n,int** arr){
    int i,j;
    for(i=0;i<n;i++){
        for(j=0;j<n;j++){
            printf("%d ",arr[i][j]);
        }
        printf("\n");
    }
}

int main(){
    int n,i,j;
    printf("Enter n of nxn square matrix:- ");
    scanf("%d",&n);
    // int arr[n][n];
    int **arr = (int**)calloc(n,sizeof(int*));
    for(i=0;i<n;i++){
        *(arr+i) = (int*)calloc(n,sizeof(int));
    }

    for(int i=0;i<n;i++){
        for(int j=0;j<n;j++){
            scanf("%d",&arr[i][j]);
        }
    }

    printf("The matrix entered by the user is:- \n");
    // for(i=0;i<n;i++){
    //     for(j=0;j<n;j++){
    //         printf("%d ",arr[i][j]);
    //     }
    //     printf("\n");
    print_mat(n,arr);

    // }

```

```
printf("\n");
non_zero(n,arr);
sum_udiag(n,arr);
swap_major_minor(n,arr);
printf("The matrix after the major diagonal matrix and minor diagonal
matrix is swapped:- \n");
print_mat(n,arr);
}

// Code by Aditya Choudhury
```

Output:-

```
Enter n of nxn square matrix:- 3
1 2 3 4 5 6 7 8 9
The matrix entered by the user is:-
1 2 3
4 5 6
7 8 9

Number of non-zero elements is 0
Sum of the elements above major diagonal is 11
The matrix after the major diagonal matrix and minor diagonal matrix is
swapped:-
3 2 1
4 5 6
9 8 7
```