CHAPTER 6 - ARRAYS

Exercise 1: Write a C program creates menu as below:

1. Inputting number's elements and all elements of array.
2. Display all elements of array to the screen
3. Find and display min and max element
4. Calculate and display total of all elements
5. Exit from program

When user chooses 1: Input number of elements and all elements of the array; chooses 2: display all elements of the array; chooses 3: Find and display min and max element; chooses 4: Calculate and display total of all elements; chooses 5: Exit from program.

- Solution
- Pseudo code

```
BEGIN
    REPEAT
        DISPLAY MENU
        INPUT Choice
        CASE Choice
            case 1: INPUT n
                FOR i=0 TO n-1 DO
                    INPUT a[i]
                END_FOR
            case 2: FOR i=0 TO n-1 DO
                DISPLAY a[i]
```

```
                case 3: min=a[0]
                        max=a[0]
                        FOR i=1 TO n-1 DO
                                IF a[i]>max THEN
                                        max=a[i]
                                END_IF
                                IF a[i]<min THEN
                                        min=a[i]
                                END_IF
                        END_FOR
                        DISPLAY min,max
                case 4: sum=0
                        FOR i=0 TO n-1 DO
                                sum=sum+a[i]
                        END_FOR
                        DISPLAY sum
                END_CASE
        UNTIL choice=5
    END
```

- C code

```
/*Program to display menu and let user choose the work
```

```
date writen:02.07.2008
author:
version:1.0*/
#include<stdio.h>
#include<conio.h>
void main(void)
{
     //declare variable
     int n;//number element of array
     int i;//index of element
     int sum;
     int min;//store min element
     int max;//store max element
     int a[100];
     int choice;
     //Clear screen
     clrscr();
     do
     {
          //display menu
          printf("\n\t\t1.Enter number element and all element
of array");
          printf("\n\t\t2.Display all elements of array");
          printf("\n\t\t3.Find and display min and max element
of array");
          printf("\n\t\t4.Calculate and display total all
elements of array");
          printf("\n\t\t5.Exit from program");
          printf("\n\t\tEneter your choice please:");
          scanf("%d",&choice);
          switch(choice)
          {
```

```
                case 1:printf("\nEnter the number element of
array:");
                       scanf("%d",&n);
                       for(i=0;i<n;i++)
                       {
                     printf("\na[%d]=",i);
                     scanf("%d",&a[i]);
                       }
                       break;
                case 2:printf("\nValue of all elements:");
                       for(i=0;i<n;i++)
                     printf("%5d",a[i]);
                       break;
                case 3:min=a[0];
                       max=a[0];
                       for(i=1;i<n;i++)
                       {
                     if(a[i]>max)
                          max=a[i];
                     if(a[i]<min)
                          min=a[i];
                       }
                       printf("\nmin element is:%d",min);
                       printf("\nmax element is:%d",max);
                       break;
                case 4:sum=0;
                       for(i=0;i<n;i++)
                     sum=sum+a[i];
                       printf("\nSum of all elements is:%d",sum);
                       break;
           }
```

```
    }
    while(choice!=5);
    printf("\nPress any key to continue");
    getch();//stop screen to view result
}
```

Exercise 2: Write a C program inputs exam score range from 1 to 100 of 40 students from the keyboard and store in the array. The program should count and print the number of outstanding scores (90-100), the number of high average scores (70-89), the number of satisfactory scores (50-69), and the number of unsatisfactory scores (1-49).

- Solution
- Pseudo code

```
BEGIN
    DEFINE CONST MAX_SIZE = 40
    outStandingScore=0
    highAverageScore=0
    satisfactoryScore=0
    unsatisfactoryScore=0
    FOR i=0 TO MAX_SIZE - 1 DO
        INPUT Score[i]
    END_FOR
    FOR i=0 TO MAX_SIZE - 1  DO
            DISPLAY a[i]
    END_FOR
    FOR i=0 TO MAX_SIZE - 1  DO
            IF Score[i]>=90 THEN
                    outStandingScore=outStandingScore+1
            ELSE
                    IF Score[i]>=70 THEN
                            highAverageScore = highAverageScore+1
```

```
                ELSE IF Score[i]>=50 THEN
                        satisfactoryScore = satisfactoryScore+1
                    ELSE
                        unsatisfactoryScore= unsatisfactoryScore+1
                    END_IF
                END_IF
            END_IF
        END_FOR
        DISPLAY outStandingScore
        DISPLAY highAverageScore
        DISPLAY satisfactoryScore
        DISPLAY unsatisfactoryScore
END
```

- C code

```
/*Program to input score of 40 students from keyboard.
Statistic number of student outstandingScore, highAverageScore,
satisfactoryScore, unsatisfactoryScore.
date writen:03.07.2008
author:
version:1.0*/
#include<stdio.h>
#include<conio.h>
//declare const
#define MAX_SIZE 40

void main(void)
{
     //declare variable
     int i;//index of element
     int outstandingScore=0;
```

```
    int highAverageScore=0;
    int satisfactoryScore=0;
    int unsatisfactoryScore=0;
    int score[MAX_SIZE];
    //Clear screen
    clrscr();
    //input exam score for 40 students
    for(i=0;i<MAX_SIZE;i++)
    {
         printf("\nEnter exam score for student %d:",i+1);
         scanf("%d",&score[i]);
    }
    //display to the screen student's score
    printf("\nStudents score\n");
    for(i=0;i<MAX_SIZE;i++)
         printf("%4d",score[i]);
    //statistic
    for(i=0;i<MAX_SIZE;i++)
    {
         if(score[i]>=90)
              outstandingScore++;
         else if(score[i]>=70)
              highAverageScore++;
              else if(score[i]>=50)
                   satisfactoryScore++;
                else
                   unsatisfactoryScore++;

    }
    printf("\nNumber of students have out standing score
are:%d",outstandingScore);
```

```
     printf("\nNumber of students have high average score
are:%d",highAverageScore);
     printf("\nNumber of students have satisfactory score
are:%d",satisfactoryScore);
     printf("\nNumber of students have unsatisfactory score
are:%d",unsatisfactoryScore);
     printf("\nPress any key to continue");
     getch();//stop screen to view result
}
```

Exercise 3: Write a C program inputs the number elements and elements of array from the keyboard. Display to the screen all elements of given array. Sort the array ascending. Display the array after sorting to the screen.

- **Solution**
- **Pseudo code**

```
BEGIN
    INPUT n
    {Input array from the key board}
    FOR i=0 TO n-1 DO
        INPUT a[i]
    END_FOR
    {Display array to the screen}
    FOR i=0 TO n-1 DO
        DISPLAY a[i]
    END_FOR
    {Sorting the array ascending}
    FOR i=0 TO n-2 DO
        FOR j=i+1 TO n - 1 DO
            IF a[j]<a[i] THEN
                temp=a[i]
                a[i]=a[j]
```

a[j]=tg

END_IF

END_FOR

END_FOR

{Display sorting array to the screen}

FOR i=0 TO n-1 DO

DISPLAY a[i]

END_FOR

END

- **C code**

```
/*Program to input, sort ascending and display array.
date writen:06.07.2008
author:
version:1.0*/
#include<stdio.h>
#include<conio.h>

void main(void)
{
     //declare variable
     int i;//index of element
     int j;
     int temp;
     int n;//number of elements
     float a[100];
     //Clear screen
     clrscr();
     //input the number of elements
     printf("\nEnter the number of item:");
     scanf("%d",&n);
     //input the array
```

```
    for(i=0;i<n;i++)
    {
        printf("\nEnter the element %d:",i+1);
        scanf("%f",&a[i]);
    }
    //display to the screen the array
    printf("\n\nAll elements of the array are:");
    for(i=0;i<n;i++)
        printf("%8.2f",a[i]);
    //sorting
    for(i=0;i<n-1;i++)
        for(j=i;j<n;j++)
        {
            if(a[j]<a[i])
            {
                temp=a[i];
                a[i]=a[j];
                a[j]=temp;
            }
        }
    //print array after sorting
    printf("\n\nAll elements of the array after sorting are:");
    for(i=0;i<n;i++)
        printf("%8.2f",a[i]);

    printf("\nPress any key to continue");
    getch();//stop screen to view result

}
```

Exercise 4: Write a C program inputs array of integer, display it to the screen. Display and calculate total prime number in the array. Display result to the screen.

- **Solution:**
- **Pseudo code**

```
BEGIN
    INPUT n {n is element of array}
    FOR i=0 TO n-1 DO
            INPUT a[i]
    END_FOR
    {Display array to the screen}
    FOR i=0 TO n-1 DO
            DISPLAY a[i]
    END_FOR
    {Calculate total prime number in the array}
    total=0
    FOR i=0 TO n-1 DO
    {Check a[i] is prime number or not}
        flag=0
        FOR j=2 TO a[i] - 1 DO
            IF a[i] MOD j=0 THEN
                    flag=1
                    EXIT from for loop
            END_IF
        END_FOR
        IF flag=0 THEN {a[i] is prime number because it has only divisor are 1
        and it self}
            total = total + a[i]
        END_IF
    END_FOR
```

DISPLAY total

END

- **C code**

```
/*Program to input, display array, Display and calculate total
prime number in the array.
date writen:07.07.2008
author:
version:1.0*/
#include<stdio.h>
#include<conio.h>
void main(void)
{
     //declare variable
     int i;//index of element
     int j;
     int flag;
     int total=0;
     int n;//number of elements
     int a[100];
     //Clear screen
     clrscr();
     //input the number of elements
     printf("\nEnter the number of item:");
     scanf("%d",&n);
     //input the array
     for(i=0;i<n;i++)
     {
          printf("\nEnter the element %d:",i+1);
          scanf("%i",&a[i]);
     }
```

```
     //display to the screen the array
     printf("\n\nAll elements of the array are:");
     for(i=0;i<n;i++)
          printf("%4d",a[i]);
     //display and calculate total prime number in the array
     printf("\nPrime number in the array is:");
     for(i=0;i<n;i++)
     {
          flag=0;
          for(j=2;j<a[i];j++)
          {
               if(a[i]%j==0)
               {
                    flag=1;//mark a[i] has divisor difference
from 1
                    break;//exit from for loop
               }
          }
          if(flag==0)
          {
               printf("%4d",a[i]);//display prime number to the
screen
               total+=a[i];
          }
     }
     //print result
     printf("\n\nTotal of prime numbers is:%d",total);
     printf("\nPress any key to continue");
     getch();//stop screen to view result

}
```

Exercise 5: Write a C program inputs two matrixes from keyboard. Calculate total of two given matrixes. Display three matrixes to the screen.

- **Solution**
- **Pseudo code**

```
BEGIN
    INPUT row {input number of row of matrixes}
    INPUT col  {input number of column of matrixes}
    {Input two matrixes and calculate total of two matrixes}
    FOR i=0 TO row -1 DO
        FOR j=0 TO col - 1 DO
            INPUT A[i][j]
            INPUT B[i][j]
            C[i][j]=A[i][j]+B[i][j]
        END_FOR
    END_FOR
  {Display three matrixes to the screen}
    FOR i=0 TO row - 1 DO
        FOR j=0 TO col - 1 DO
            DISPLAY A[i][j], B[i][j], C[i][j]
        END_FOR
        Return new line
```

END_FOR

END

- **C code**

```
/*Program to input two matrixes from keyboard. Calculate total
of two given matrixes.
Display three matrixes to the screen.
date writen:07.07.2008
author:
version:1.0*/
#include<stdio.h>
#include<conio.h>
void main(void)
{
     //declare variable
     int i;//index of row
     int j;//index of column
     int row;
     int col;
     int A[10][10];//first matrix
     int B[10][10];//second matrix
     int C[10][10];//matrix total
     //Clear screen
     clrscr();
     //input the number of row and column

     printf("\nEnter the number of row:");
     scanf("%d",&row);
     printf("\nEnter the number of column:");
     scanf("%d",&col);
     //input and calculate total of two matrixes
```

```
     for(i=0;i<row;i++)
          for(j=0;j<col;j++)
     {
          printf("\nEnter the element at row %d and column
%d:",i+1,j+1);
          printf("\nA[%d][%d]:",i,j);
          scanf("%i",&A[i][j]);
          printf("\nB[%d][%d]:",i,j);
          scanf("%i",&B[i][j]);
          C[i][j]=A[i][j]+B[i][j];

     }
     //display three matrixes to the screen
     printf("\n\nAll elements of the three matrixes are\n");
     for(i=0;i<row;i++)
     {
          for(j=0;j<col;j++)
               printf("A[%d][%d]=%d, B[%d][%d]=%d,
C[%d][%d]=%d\t",i,j,A[i][j],i,j,B[i][j],i,j,C[i][j]);

          printf("\n");
     }
     printf("\nPress any key to continue");
     getch();//stop screen to view result

}
```

II. EXERCISES WITHOUT SOLUTION

Exercise 1: Write a C program inputs a float array from the keyboard. Then do following tasks:

- Display to the screen the given array.
- Display positive elements of the array to the screen.

- Calculate and display to the screen total negative elements.
- Sort array descending. Display array to the screen after sorting

Hint: To display positive elements and calculate total negative elements: Scan through the array, each element you should check if it is positive or not. If it is positive you should display it to the screen, otherwise you should accumulate it to total.

Exercise 2: Write a C program inputs array of integer from the keyboard, display it to the screen. Display and calculate total perfect number in the array. Display result to the screen.

Exercise 3: Write a C program inputs array of integer, display it to the screen. Display and calculate total square number in the array. Display result to the screen.

Exercise 4: Write a C program inputs array of integer from the keyboard. Then do following tasks:

- Display to the screen the given array.
- Count even and odd number in the array. Display result to the screen.
- Enter an integer. Count number of elements equals to given integer. Display result to the screen.

Exercise 5: Write a C program inputs a matrix of integer from the keyboard. Then do following tasks:

- Display the given matrix to the screen.
- Calculate total elements in even rows. Display result to the screen.

Sorting all columns ascending. Display matrix after sorting to the screen