

Batch: C1-3

Roll No.: 56

Experiment / assignment / tutorial No. 3

Grade: AA / AB / BB / BC / CC / CD / DD

Signature of the Staff In-charge with date

TITLE: Write a program in C to demonstrate use of arrays

AIM: Program to sort the 1D array in the ascending or descending order and then accept the element from user and insert in the same array at its correct place by keeping array sorted

Write a program to find the Transpose of a Matrix.

Expected OUTCOME of Experiment:

Apply basic concepts of C programming for problem solving.(CO1 and CO2).

Books/ Journals/ Websites referred:

1. Programming in C, second edition, Pradeep Dey and Manas Ghosh, Oxford University Press.
2. Programming in ANSI C, fifth edition, E Balagurusamy, Tata McGraw Hill.
3. Introduction to programming and problem solving , G. Michael Schneider ,Wiley India edition.
4. <http://cse.iitkgp.ac.in/~rkumar/pds-vlab/>

Problem Definition:

1. The program takes a 1D array and sorts it in the specified manner. The user enters an element and the same has to be inserted at the correct place in the sorted array.

2. Write a program to find the Transpose of a Matrix.

- Entered matrix:

1 4 0

-5 2 7

- Transpose of the matrix:

1 -5

4 2

0 7

Algorithm:

1. Start
2. Take input of array size
3. Take input of array elements
4. Ask if sorting should be ascending or descending
5. Perform sorting based on user input
6. Display sorted array
7. Take input of new element to insert
8. Perform sorting on new element
9. Display Final Output
10. Stop

Implementation details:

Question-1.

```
#include <stdio.h>

int main(){
    int a;
    system("cls");
    printf("Enter the size of the array: ");
    scanf("%d", &a);
    int array[a];

    for (int i = 0; i < a; i++)
    {
        printf("Enter element %d: ", i + 1);
        scanf("%d", &array[i]);
        printf("\n");
    }

    printf("Array: ");
    for(int i = 0; i < a; i++)

    {
        printf("%d ", array[i]);
    }
}
```

```
    }

    for(int i = 0; i < a; i++)
    {
        for(int j = 0; j < a - i - 1; j++)
        {
            if(array[j] > array[j + 1]){
                int temp = array[j];
                array[j] = array[j+1];
                array[j+1] = temp;
            }
        }
    }

    printf("Sorted array: ");
    for(int i = 0; i < a; i++)
    {
        printf("%d ", array[i]);
    }
}
```

Question-2.

```
#include <stdio.h>

#define MAX_ROWS 10
#define MAX_COLS 10

void transposeMatrix(int mat[MAX_ROWS][MAX_COLS], int
transposed[MAX_COLS][MAX_ROWS], int rows, int cols) {
    int i, j;
    for (i = 0; i < rows; i++) {
        for (j = 0; j < cols; j++) {
            transposed[j][i] = mat[i][j];
        }
    }
}
```

```
void printMatrix(int mat[MAX_ROWS][MAX_COLS], int rows, int cols) {
    int i, j;
    for (i = 0; i < rows; i++) {
        for (j = 0; j < cols; j++) {
            printf("%d\t", mat[i][j]);
        }
        printf("\n");
    }
}

int main() {
    int matrix[MAX_ROWS][MAX_COLS];
    int transposed[MAX_COLS][MAX_ROWS];
    int rows, cols;

    printf("Enter the number of rows and columns of the matrix: ");
    scanf("%d %d", &rows, &cols);

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

    printf("Entered matrix:\n");
    printMatrix(matrix, rows, cols);

    transposeMatrix(matrix, transposed, rows, cols);

    printf("\nTranspose of the matrix:\n");
    printMatrix(transposed, cols, rows);

    return 0;
}
```



Output(s):

Question-1.

```
Enter the size of the array: 5
Enter element 1: 1

Enter element 2: 66

Enter element 3: 44

Enter element 4: 87

Enter element 5: 32

Array: 1 66 44 87 32 Sorted array: 1 32 44 66 87

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```

Question-2

```
Enter the number of rows and columns of the matrix: 3 3
Enter the elements of the matrix:
2
3
4
2
1
3
2
3
4
Entered matrix:
2      3      4
2      1      3
2      3      4

Transpose of the matrix:
2      2      2
3      1      3
4      3      4
```

Conclusion:

Hence we learnt about sorting array and 2d array

Post Lab Questions

1. Write a program to enter n numbers, store them in an array and rearrange the array in the reverse order.
2. Write a program which performs the following tasks:
 - a) Initialize an integer array of 10 elements in main()
 - b) Pass the entire array to a function modify()
 - c) In modify() multiply each element of array by 3
 - d) Return the control to main() and print the new array elements in main()

1.

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

```
int main() {  
    int n;  
  
    printf("Enter the number of elements: ");  
    scanf("%d", &n);  
  
    // Declare an array of size n  
    int arr[n];  
  
    // Input the elements  
    printf("Enter %d numbers:\n", n);  
    for (int i = 0; i < n; i++) {  
        scanf("%d", &arr[i]);  
    }  
  
    // Rearrange the array in reverse order  
    for (int i = 0; i < n / 2; i++) {  
        int temp = arr[i];  
        arr[i] = arr[n - i - 1];  
        arr[n - i - 1] = temp;  
    }  
  
    // Print the reversed array  
    printf("Reversed array: ");  
    for (int i = 0; i < n; i++) {  
        printf("%d ", arr[i]);  
    }  
    printf("\n");  
  
    return 0;  
}
```

2.

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

```
// Function prototype  
void modify(int arr[], int size);
```

```
int main() {
```

```
int arr[10] = {1, 2, 3, 4, 5, 6, 7, 8, 9, 10};

// Call modify function
modify(arr, 10);

// Print modified array elements
printf("Modified array elements:\n");
for (int i = 0; i < 10; i++) {
    printf("%d ", arr[i]);
}
printf("\n");

return 0;
}

// Function to multiply each element of the array by 3
void modify(int arr[], int size) {
    for (int i = 0; i < size; i++) {
        arr[i] *= 3;
    }
}
```

Date: _____

Signature of faculty in-charge