

7.1

```
#include <stdio.h>
#include <stdlib.h>
#include <math.h>
int main()
{
    int n;
    printf("Enter the value of n : ");
    scanf("%d", &n);
    int a[n];
    printf("Enter the array elements : \n");
    for (int i = 0; i < n; i++)
    {
        scanf("%d", &a[i]);
    }
    printf("The array elements are : \n");
    for (int i = 0; i < n; i++)
    {
        printf("%d ", a[i]);
    }
    int p = a[0];
    for (int i = 1; i < n; i++)
    {
        p ^= a[i];
    }
    printf("\nThe element in the array that occurs only once is : ");
    printf("%d\n", p);
    return 0;
}
```

7.2

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

void histFreq(char arr[])
{
    int i, j, c = 0;
    for (i = 0; i < 26; i++)
    {
        for (j = 0; arr[j] != '\0'; j++)
        {
            if (arr[j] == 65 + i || arr[j] == 97 + i)
                c++;
        }
        if (c != 0)
            printf("The character %c is repeated %d times in the array\n", 65 + i, c);
        c = 0;
    }
}

int main()
{
    int n, i, j, count;

    printf("\nEnter the number of elements : ");
    scanf("%d", &n);
    gets();
    char arr[n];
    printf("Enter the array elements : \n");
    fflush(stdin);
    gets(arr);
    histFreq(arr);
    return 0;
}
```

7.3

```
#include <stdio.h>
#include <stdlib.h>
#include <math.h>
int main()
{
    int n;
    printf("Enter the number of elements : ");
    scanf("%d", &n);
    int a[n];
    printf("Enter the array elements : \n");
    for (int i = 0; i < n; i++)
    {
        scanf("%d", &a[i]);
    }
    printf("The array elements are : \n");
    for (int i = 0; i < n; i++)
    {
        printf("%d ", a[i]);
    }
    printf("\n");
    int largest = a[0];
    int j = 0;
    for (int i = 1; i < n; i++)
    {
        if (a[i] > largest)
        {
            largest = a[i];
            j = i;
        }
    }
    int secondLargest = a[0];
    for (int i = 1; i < n; i++)
    {
        if (i == j)
        {
            continue;
        }
        else if (a[i] > secondLargest)
        {
            secondLargest = a[i];
        }
    }
    printf("Largest element in the array is : \n");
    printf("%d\n", largest);
    printf("Second Largest element in the array is : \n");
    printf("%d\n", secondLargest);
    return 0;
}
```

8.1

```
#include <stdio.h>
int Orthogonal(int n, int a[20][20])
{
    int prod[n][n], i, j, k, sum;
    for (i = 0; i < n; i++)
    {
        for (j = 0; j < n; j++)
        {
            sum = 0;
            for (int k = 0; k < n; k++)
            {
                sum += (a[i][k] * a[j][k]);
            }
            if (i != j && sum != 0)
        }
    }
}
```

```

        return 0;
    if (i == j && sum != 1)
        return 0;
    }
}
return 1;
}
int main()
{
    int rows, column, i, j;
    printf("Enter the rows of the matrix : ");
    scanf("%d", &rows);
    printf("Enter the column of the matrix : ");
    scanf("%d", &column);
    printf("Enter the elements of the matrix \n");
    int a[20][20];
    for (i = 0; i < rows; i++)
    {
        printf("Enter the elements for row %d\n", i + 1);
        for (j = 0; j < column; j++)
            scanf("%d", &a[i][j]);
    }
    if (rows != column)
        printf("The matrix is not orthogonal\n");
    else
    {
        if (Orthogonal(rows, a))
        {
            printf("The matrix is orthogonal\n");
        }
        else
        {
            printf("The matrix is not orthogonal\n");
        }
    }
}

```

8.2

```

#include <stdio.h>
int isLowerTri(int X[][10], int n)
{
    int i, j, f = 1;
    for (i = 0; i < n; i++)
    {
        for (j = i + 1; j < n; j++)
            if (X[i][j] != 0)
            {
                f = 0;
            }
        if (f == 0)
            break;
    }
    return f;
}

```

```

int isUpperTri(int X[][10], int n)
{
    int i, j, f = 1;
    for (i = 0; i < n; i++)
    {
        for (j = 0; j < i; j++)
            if (X[i][j] != 0)
            {
                f = 0;
            }
    }
}

```

```

        if (f == 0)
            break;
    }
    return f;
}
int main()
{
    int n, A[10][10], i, j;
    printf("Enter the number of rows/columns of the square matrix : ");
    scanf("%d", &n);
    printf("Enter the matrix elements : \n");
    for (i = 0; i < n; i++)
        for (j = 0; j < n; j++)
            scanf("%d", &A[i][j]);
    printf(isUpperTri(A, n) ? "Matrix is Upper Triangular and " : "Matrix is not
Upper Triangular and ");
    printf(isLowerTri(A, n) ? "\nMatrix is Lower Triangular " : "\nMatrix is not
Lower Triangular");
}

```

10.1

```

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

int factorial(int n)
{
    if (n == 0)
    {
        return 1;
    }
    return n * factorial(n - 1);
}

int main()
{
    int n;
    printf("Enter the value of n : \n");
    scanf("%d", &n);
    int r;
    printf("Enter the value of r : \n");
    scanf("%d", &r);
    if (n >= r)
    {
        int f = factorial(n) / (factorial(n - r) * factorial(r));
        printf("The value of nCr is : %d\n", f);
    }
    else
    {
        printf("Out of bounds input!\n");
    }
}

```

10.2

```

#include <stdio.h>

void decToHex(int n)
{
    int hex = 0;
    if (!n)
        return;
    else
    {
        hex = n % 16;
        decToHex(n / 16);
    }
}

```

```

}
if (hex > 9)
    printf("%c", 'A' + (hex - 10));
else
    printf("%d", hex);
}

```

```

int main()
{
    int num = 0;
    printf("Enter number: ");
    scanf("%d", &num);
    decToHex(num);
    printf("\n");

    return 0;
}

```

10.3

```

int Max(int n, int arr[n], int max_i, int i)
{
    if (i == n)
        return max_i;
    else
    {
        max_i = arr[i] > max_i ? arr[i] : max_i;
        return Max(n, arr, max_i, i + 1);
    }
}

```

```

int Min(int n, int arr[n], int min_i, int i)
{
    if (i == n)
        return min_i;
    else
    {
        min_i = arr[i] < min_i ? arr[i] : min_i;
        return Min(n, arr, min_i, i + 1);
    }
}

```

```

void main()
{
    int i, n;
    printf("Enter the array size: ");
    scanf("%d", &n);
    int a[n];
    printf("Enter the array elements: \n");
    for (i = 0; i < n; i++)
    {
        scanf("%d", &a[i]);
    }
    printf("The MAX element is: %d\n", Max(n, a, a[0], 1));
    printf("The MIN element is: %d\n", Min(n, a, a[0], 1));

    return;
}

```

10.4

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

```

int sumOfDigits(int n)
{
    if (n == 0)
        return 0;
    return (n % 10 + sumOfDigits(n / 10));
}

```

```

}
int main()
{
    int n;
    printf("Enter the number :");
    scanf("%d", &n);
    printf("Sum of digits: %d \n", sumOfDigits(n));
    return 0;
}

```

12.2

```

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

```

```

typedef struct
{

```

```

    char name[40];
    char phone[13];
    char email[50];

```

```

} info;

```

```

void towrite();
void toread();

```

```

void main()
{

```

```

    int choice;
    char n;
    while(scanf("%c",&n))
    {

```

```

        printf("\nEnter:\n1.\tTo write.\n2.\tTo display every contact.\n");
        scanf("%d",&choice);
        switch(choice)
        {

```

```

            case 1:
                write();
                break;

```

```

            case 2:
                read();
                break;

```

```

            default:
                printf("\nERROR:\tWrong INPUT!");

```

```

        }
        printf("\nEnter any number to stop \n\t\tOr else enter any

```

```

character:\n");
    }

```

```

    return;
}

```

```

void write()
{

```

```

    FILE *outfile;
    char yn;

```

```

    outfile=fopen("directory.txt", "a");
    if (outfile == NULL)

```

```

    {
        fprintf(stderr, "\nERROR: File not opened.\n");
        exit (1);
    }

```

```

}

do
{
    info input;

    printf("\nEnter the name of the person\n");
    scanf("%[^\\n]*c",input.name);
    printf("\nEnter the phone of the person\n");
    scanf("%[^\\n]*c",input.phone);
    printf("\nEnter the e-mail of the person\n");
    scanf("%[^\\n]*c",input.email);

    fwrite (&input, sizeof(info), 1, outfile);

    if(fwrite != 0)
        printf("\nContents to file written SUCCESSFULLY!\n");
    else
        printf("\nERROR: writing in file!\n");

    printf("\nDo you want to continue?[y/n]\t");
    scanf("%c",&yn);
}while(yn=='Y' || yn=='y');

fclose (outfile);
}

void read()
{
    FILE *infile;
    info input;

    infile = fopen ("directory.txt", "r");
    if (infile == NULL)
    {
        fprintf(stderr, "\nERROR: File not opened.\n");
        exit (1);
    }

    while(fread(&input, sizeof(info), 1, infile))
        printf ("%s\t%s\t%s\n", input.name, input.phone, input.email);

    fclose (infile);
}

```