6 a) Write a C program to generate all the prime numbers between 1 and n, where n is a value supplied by the user using Sieve of Eratosthenes algorithm.

https://onlinegdb.com/BGtEZGVFg

```c
#include<stdio.h>
void main()
{
   int  n, i, j, count;
   printf("*****Prime Number Series******\n");
   printf("Enter any number\n");
   scanf("%d", &n);
   printf("The Prime Numbers between 1 to %d\n",n);
   for(i = 1; i <= n; i++)
   {
      count = 0;
      for(j = 1; j <=i; j++)
      if(i % j == 0)
      {     count++;
      }
      if(count == 2)
      {
     printf("%d\t", i);
      }
   }
}
```

Output:

```
*****Prime Number Series******
Enter any number
20
The Prime Numbers between 1 to 20
2       3       5       7       11      13      17      19
```

6 b) Write a C program that uses non recursive function to search for a Key value in a given list of integers. Use linear search method.

https://onlinegdb.com/DDtt3n32k

```c
int linearSearch(int a[], int n, int val);
#include <stdio.h>
int main() {
  int a[] = {70, 40, 30, 11, 57, 41, 25, 14, 52}; // given array
  int val;
  printf("\nEnter element to serach in Array:");
  scanf("%d",&val);
  int n = sizeof(a) / sizeof(a[0]); // size of array
  int res = linearSearch(a, n, val); // Store result
  printf("The elements of the array are: ");
  for (int i = 0; i < n; i++)
  printf("%d ", a[i]);
  printf("\nElement to be searched is: %d", val);
  if (res == -1)
  printf("\nElement is not present in the array");
  else
  printf("\nElement is present at %d position of array", res);
  return 0;
}
```

```c
int linearSearch(int a[], int n, int val) {
  // Going through array sequencially
  for (int i = 0; i < n; i++)
    {
        if (a[i] == val)
        return i+1;
    }
  return -1;
}
```

Output:

```
Enter element to serach in Array:30

The elements of the array are: 70 40 30 11 57 41 25 14 52

Element to be searched is: 30

Element is present at 3 position of array
```

7 a) Write a menu-driven C program that allows a user to enter n numbers and then choose between finding the smallest, largest, sum, or average. The menu and all the choices are to be functions. Use a switch statement to determine what action to take. Display an error message if an invalid choice is entered.

https://onlinegdb.com/1MAue95q3

```
#include <stdio.h>
#include<stdlib.h>
int option;
int menu(void);
void small(int s[]);
void large(int s[]);
void sum(int s[]);
void avg(int s[]);
int main()
{
    int num[100];
    int n;
    printf("\nEnter n Value: ");
    scanf("%d",&n);
    printf("\n Enter %d values:",n);
    for(int i=0;i<n;i++)
    {
        scanf("%d",&num[i]);
    }
    option = menu();
    switch (option)
     {
     case 1: small(num);
          break;
     case 2: large(num);
          break;
     case 3: sum(num);
          break;
     case 4: avg(num);
     }

}
int menu(void)
{
     // Local Declarations
     int option;
     // Statements
     printf("\t**********************");
     printf("\n\t*        MENU          *");
     printf("\n\t*                      *");
     printf("\n\t*   1. SMALLEST       *");
```

```
     printf("\n\t*   2. LARGEST        *");
     printf("\n\t*   3. SUM            *");
     printf("\n\t*   4. AVERAGE        *");
     printf("\n\t)**********************");
     printf("\n Please type your choice: ");
     scanf(" %d", &option);
     if (option>4)
     {
          printf("INVALID CHOICE");
          exit(0);
     }
     return option;
}
void small(int s[])
{
    int min=s[0];
    for(int i=1;i<5;i++)
    {
        if(s[i]<min)
        {
        min=s[i];
        }
    }
    printf("\nMin:%d\n",min);
}
void large(int s[])
{
    int large=s[0];
    for(int i=1;i<5;i++)
    {
        if(s[i]>large)
        {
        large=s[i];
        }
    }
    printf("\nMax:%d\n",large);
}
void sum(int s[])
{
    int sum=0;
    for(int i=0;i<5;i++)
    {
        sum=sum+s[i];
    }
    printf("\nSum:%d\n",sum);
}
void avg(int s[])
```

```
{
    float avg=0.0;
    int sum=0;
    for(int i=0;i<5;i++)
    {
        sum=sum+s[i];
    }
    avg=sum/5.0;
    printf("\nAverage:%f\n",avg);
}
```

Output:

```
Enter n Value: 5


Enter 5 values:10 20 30 40 50
        **********************
        *        MENU
        *                    *
        *   1. SMALLEST      *
        *   2. LARGEST       *
        *   3. SUM           *
        *   4. AVERAGE       *
        )**********************
 Please type your choice: 3


Sum:150
```

7 b) Write a C program that uses non recursive function to search for a Key value in a given sorted list of integers. Use binary search method.

https://onlinegdb.com/lpmPeRhO2

```c
#include <stdio.h>
int BinarySearch(int array[], int start_index, int end_index, int element){
   while (start_index <= end_index){
      int middle = start_index + (end_index- start_index )/2;
      if (array[middle] == element)
         return middle;
      if (array[middle] < element)
         start_index = middle + 1;
      else
         end_index = middle - 1;
   }
   return -1;
}
```

```c
int main(void){
    int array[] = {1, 4, 7, 9, 16, 56, 70, 90};
    int n = 8;
    int element,i;
    printf("\nElements in the Array: ");
    for(i=0;i<8;i++)
    printf("%d ",array[i]);
    printf("\nEnter Element to Search:");
    scanf("%d",&element);
    int found_index = BinarySearch(array, 0, n-1, element);
    if(found_index == -1 ) {
       printf("Element not found in the array ");
    }
    else {
       printf("Element found at index : %d",found_index);
    }
    return 0;
}
```

Output:

Elements in the Array: 1 4 7 9 16 56 70 90

Enter Element to Search:16

Element found at index : 4

8a) Write a C program that implements the Bubble sort method to sort a given list of integers in ascending order.
https://onlinegdb.com/UfX5wISjU

```c
#include<stdio.h>
void bubble_sort(int[],int);
void main()
{
int   arr[30],num,i;
    printf("\nEnter no of elements :");
    scanf("%d", &num);
    printf("\nEnter array elements :");
    for (i = 0; i<num; i++)
    scanf("%d", &arr[i]);
    bubble_sort(arr, num);
}
```

```c
void bubble_sort(int   a[],int   n)
{
int     i,j,k,temp;
    printf("\nUnsorted Data:");
    for (k=0;k<n;k++)
    {
        printf("%5d",a[k]);
    }
    for (i=1;i<n;i++)
    {
        for (j=0;j<n-1;j++)
            {
            if (a[j]>a[j+1])
                    {
                temp=a[j];
                a[j]=a[j+1];
                a[j+1]=temp;
            }
        }
        printf("\nAfter pass %d:",i);
        for (k=0;k<n;k++)
        {
            printf("%5d",a[k]);
        }
    }
}
```

Output:

```
Enter no of elements :6
Enter array elements :98 53 22 7 44 35
Unsorted Data:   98   53   22    7   44   35
After pass 1:   53   22    7   44   35   98
After pass 2:   22    7   44   35   53   98
After pass 3:    7   22   35   44   53   98
After pass 4:    7   22   35   44   53   98
After pass 5:    7   22   35   44   53   98
```

8 b) Write a C program that reads two matrices and uses functions to perform the following:
i) Addition of two matrices
ii) Multiplication of two matrices

i) Addition of two matrices
https://onlinegdb.com/lvAos87tn

```c
#include <stdio.h>
#include<stdio.h>
void add(int[][10],int[][10],int,int);
void main()
{
int     a[10][10],b[10][10],i,rows,j,cols;
    printf("\nEnter No. of rows and columns:");
    scanf("%d%d",&rows,&cols);
    printf("\nEnter %d elements for the first %d x %d matrix:",rows*cols,rows,cols);
    for(i=0;i<rows;i++)
    {
        for(j=0;j<cols;j++)
        {
            scanf("%d",&a[i][j]);
        }
    }
    printf("\nEnter %d elements for the second %d x %d matrix:",rows*cols,rows,cols);
    for(i=0;i<rows;i++)
    {
        for(j=0;j<cols;j++)
        {
            scanf("%d",&b[i][j]);
        }
    }
    printf("\n first matrix is:\n");
    for(i=0;i<rows;i++)
    {
        for(j=0;j<cols;j++)
        {
            printf("%2d",a[i][j]);
        }
        printf("\n");
    }
```

```c
    printf("\n second matrix is:\n");
for(i=0;i<rows;i++)
    {
        for(j=0;j<cols;j++)
        {
                printf("%2d",b[i][j]);
        }
        printf("\n");
    }
    add(a,b,rows,cols);//Function calling
}

void add(int a[][10],int b[][10],int rows,int cols)// Function Definition
{
int i,j;
    printf("\n sum of first and second matrices is:\n");
    for(i=0;i<rows;i++)
    {
        for(j=0;j<cols;j++)
        {
            printf("%2d",a[i][j]+b[i][j]);
        }
        printf("\n");
    }

}
```

Output:

```
Enter No. of rows and columns:2 2

Enter 4 elements for the first 2 x 2 matrix:1 1 1 1

Enter 4 elements for the second 2 x 2 matrix:1 1 1 1

first matrix is:
 1 1
 1 1

second matrix is:
 1 1
 1 1

sum of first and second matrices is:
 2 2
 2 2
```

ii) Multiplication of two matrices

https://onlinegdb.com/CWabPK6-J

```c
#include<stdio.h>
int mul(int[][10],int [][10],int,int,int,int);
void main()
{
    int  a[10][10],b[10][10],i,r1,r2,j,c1,c2;
    printf("\nEnter No.of rows and columns for the first matrix:");
    scanf("%d%d",&r1,&c1);//m1=rows,n1=columns of matrix 1
    printf("\nEnter %d elements for the first %dx%d matrix:",r1*c1,r1,c1);
    for(i=0;i<r1;i++)//READING ELEMENTS FOR MATRIX A
    {
        for(j=0;j<c1;j++)
        {
            scanf("%d",&a[i][j]);
        }
    }
    printf("\nEnter no. of rows and columns for the second matrix:" );
    scanf("%d%d",&r2,&c2);//m2=rows,n2=columns of matrix 2
    if(r1==c2)//CHECKING THE MATRIX MULTIPLICATION RULE.
    {
        printf("\nEnter %d elements for the second %dx%d martix:",r2*c2,r2,c2);
        for(i=0;i<r2;i++)
        {
            for(j=0;j<c2;j++)
            {
                scanf("%d",&b[i][j]);
            }
        }
        printf("\n first matrix is:\n");
        for(i=0;i<r1;i++)
        {
            for(j=0;j<c1;j++)
            {
                printf("%d\t",a[i][j]);
            }
            printf("\n");
        }
```

```
        printf("\n second matrix is:\n");
        for(i=0;i<r2;i++)
        {
            for(j=0;j<c2;j++)
            {
                printf("%d\t",b[i][j]);
            }
            printf("\n");
        }
        mul(a,b,r1,r2,c1,c2);//CALLING MULTIPLICATION MATRIX
    }
    else
    {
        printf("\n no. of rows in the 1st  matrix must be same as the no. of cols in the 2nd matrix:");
    }
}
```

```
int   mul(int a[][10],int b[][10],int r1,int r2,int c1,int c2)//FUNCTION DEFINITION
{
    int i,j,k,c[10][10];
    for(i=0;i<r1;i++)
    {
        for(j=0;j<c2;j++)
        {
            c[i][j]=0;
            for(k=0;k<c1;k++)
            {
                c[i][j]=c[i][j]+a[i][k]*b[k][j];
            }
        }
        printf("\n product of two matrices is:\n");
        for(i=0;i<r1;i++)
        {
            for(j=0;j<c2;j++)
            {
                printf("%2d\t",c[i][j]);//PRINTING RESULTANT MATRIX
            }
            printf("\n");
        }
    }
}
```

Output:

```
Enter No.of rows and columns for the first matrix:2 3

Enter 6 elements for the first 2x3 matrix:1 2 3 4 5 6

Enter no. of rows and columns for the second matrix:3 2

Enter 6 elements for the second 3x2 martix:1 2 3 4 5 6

 first matrix is:
1       2       3
4       5       6

second matrix is:
1       2
3       4
5       6

product of two matrices is:
22      28
49      64
```

9. a) Write a C program that uses functions to perform the following operations:

i) To insert a sub-string into a given main string from a given position.

https://onlinegdb.com/0WnfXLFU4

```c
#include<stdio.h>
#include <conio.h>
#include <string.h>
void main()
{
char a[30];
char b[30];
char c[50];
char d[30];
int p=0,r=0;
int n,j,i;
puts("Enter First String:");
gets(a);
puts("Enter Second String:");
gets(b);
printf("Enter the position where the item has to be inserted: ");
scanf("%d",&p);
r = strlen(a);
n = strlen(b);
for(i=0;i<p;i++)
{
 c[i]=a[i];
}
c[i]='\0';
for(i=p,j=0;i<r;i++,j++)
{
  d[j]=a[i];
}
d[i]='\0';
strcat(c,b);
strcat(c,d);
puts(c);
}
```

Output:

```
Enter First String:
Welcome
Enter Second String:
Hello
Enter the position where the item has to be inserted: 2
WeHellolcome
```

ii) To delete n characters from a given position in a given string

https://onlinegdb.com/O9OQW33RM

```c
#include<stdio.h>
#include<stdlib.h>
#include <string.h>
void main()
{
char s[30];
int p,n;
printf("Enter  String:");
gets(s);
printf("Enter the position from where to delete: ");
scanf("%d",&p);
printf("Enter the number of characters to be deleted: ");
scanf("%d",&n);
delchar(s,n,p);
}
void delchar(char *x,int a, int b)
{
int i,j;
char s1[30];
char s2[30];
int len;
len=strlen(x);
for(i=0;i<b;i++)
{
    s1[i]=x[i];
}
s1[i]='\0';
for(i=b+a,j=0;i<len;i++,j++)
{
    s2[j]=x[i];
}
s2[i]='\0';
strcat(s1,s2);
puts(s1);
}
```

Output:

```
Enter String: Hello
Enter the position from where to delete: 2
Enter the number of characters to be deleted: 2
Heo
```

9b) Write a C program that uses a non-recursive function to determine if the given string is a palindrome or not.

https://onlinegdb.com/GibjyGVDq

```c
#include<stdio.h>
#include<string.h>
#include<stdbool.h>
bool IsPalindrome(char *s);
int main()
{
    char str[20];
    bool b;
    printf("Enter String:");
    scanf("%s",str);
    b=IsPalindrome(str);
    if(b==true)
    printf("\nGiven String is Palindrome");
    else
    printf("\nGiven String is not Palindrome");

}
bool IsPalindrome(char s[20])
{
    char x[20];
    int n,i;
    n=strlen(s);
    int j=0;
    for(i=(n-1);i>=0;i--)
    {
        x[j]=s[i];
        j++;
    }
    x[j]='\0';
    //printf("%s",x);
    if(strcmp(s,x)==0)
    return true;
    else
    return false;
}
```

Output:

Enter String:malayalam

Given String is Palindrome

Enter String:hello

Given String is not Palindrome

10. a) Write a C program to replace a substring with another in a given line of text.

https://onlinegdb.com/gCpoEEtqY

```c
#include <stdio.h>
#include <string.h>
char *replace_str(char *str, char *orig, char *rep)
{
static char buffer[4096];
char *p;
int k,len;
if((p = strstr(str, orig))==NULL)
{
return str;
}
else
{
strncpy(buffer, str, p-str);
strcat(buffer,rep);
k=strlen(orig);
strcat(buffer,p+k);
len=strlen(buffer);
buffer[len]='\0';
return buffer;
}
}
int main(void)
{
char str[100],str1[50],str2[50];
printf("Enter a one line string..\n");
gets(str);
printf("Enter the sub string to be replaced..\n");
gets(str1);
printf("Enter the replacing string....\n");
gets(str2);
puts(replace_str(str, str1, str2));
return 0;
}
```

Output:

```
Enter a one line string..
Hello
Enter the sub string to be replaced..
ll
Enter the replacing string....
kk
Hekko
```

10 b) Write a C program that reads 15 names each of up to 30 characters, stores them in an array, and uses an array of pointers to display them in ascending (ie. alphabetical) order.

https://onlinegdb.com/2wD1qWB6V

```c
#include<stdio.h>
#include<string.h>
int main()
{
    int i,j,count;
    char str[15][30],temp[25];
    puts("How many strings u are going to enter?: ");
    scanf("%d",&count);
    puts("Enter Strings one by one: ");
    for(i=0;i<=count;i++)
    gets(str[i]);
    for(i=0;i<=count;i++)
    for(j=i+1;j<=count;j++)
    {
        if(strcmp(str[i],str[j])>0)
        {
            strcpy(temp,str[i]);
            strcpy(str[i],str[j]);
            strcpy(str[j],temp);
        }
    }
    printf("Order of Sorted Strings:");
    for(i=0;i<=count;i++)
    puts(str[i]);
    return 0;
}
```

Output:

```
How many strings u are going to enter?:
5
Enter Strings one by one:
Praveen
Sujith
Bharat
Amer
Vasu
Order of Sorted Strings:
Amer
Bharat
Praveen
Sujith
Vasu
```

11. a) 2's complement of a number is obtained by scanning it from right to left and complementing all the bits after the first appearance of a 1. Thus 2's complement of 11100 is 00100. Write a C program to find the 2's complement of a binary number.

https://onlinegdb.com/5-y3pQ5H1u

```c
#include <stdio.h>
#include<conio.h>
#include<string.h>
void complement (char *a);
void main()
{
char a[16];
int i;
printf("\nEnter the binary number:");
gets(a);
for(i=0;a[i]!='\0'; i++)
{
    if (a[i]!='0' && a[i]!='1')
    {
        printf("\nThe number entered is not a binary number. Enter the correct number");
        exit(0);
    }
}
complement(a);
}
```

```c
void complement(char *a)
{
int l, i, c=1;
char b[16];
l=strlen(a);
for (i=l-1; i>=0; i--)
{
    if (a[i]=='0')
        b[i]='1';
    else
        b[i]='0';
}
for(i=l-1; i>=0; i--)
{
    if(c==1 && b[i]=='0')
    {
        b[i]='1';
        c=0;
    }
    else if (c==1 && b[i]=='1')
    {
        b[i]='0';
        c=1;
    }
}
b[l]='\0';
printf("\nThe 2's complement is : %s", b);
}
```

Output:

```
Enter the binary number:10101010

The 2's complement is : 01010110
```

11 b) Write a C program to convert a positive integer to a roman numeral. Ex. 11 is converted to XI.

https://onlinegdb.com/1lmEIoLhl

```c
#include<stdio.h>
#include<conio.h>
#include<string.h>
#include<stdlib.h>
void main()
{
    int len,i,j,k;
    int a[30];
    char rom[20];
    printf("Enter the Roman Numeral:");
    scanf("%s",rom);
    len=strlen(rom);
    for(i=0;i<len;i++) // loop will continue until I is not graterthan length.
    {
        if(rom[i]=='I')
            a[i]=1;
        else if(rom[i]=='V')
            a[i]=5;
        else if(rom[i]=='X')
            a[i]=10;
        else if(rom[i]=='L')
            a[i]=50;
        else if(rom[i]=='C')
            a[i]=100;
        else if(rom[i]=='D')
            a[i]=500;
        else if(rom[i]=='M')
            a[i]=1000;
        else
        {
            printf("\nInvalid Value");
            exit(0);
        }
    }
```

```c
    k=a[len-1];
    for(i=len-1;i>0;i--) // loop will continue until I lessthan zero
    {
        if(a[i]>a[i-1]) // check the condition
            k=k-a[i-1];
        else if(a[i]==a[i-1] || a[i]<a[i-1])
            k=k+a[i-1];
    }
    printf("\nIts Decimal Equivalent is:");
    printf("%d",k);

}
```

Output:

Output:
Enter the Roman Numeral :VI
Its Decimal Equivalent is:6

16 a) Write a C Program to calculate the sum of n numbers entered by the user using malloc( ) and free() functions.

https://onlinegdb.com/fimPJB1I9

```c
#include <stdio.h>
#include <stdlib.h>
int main()
{
    int *p;
    int n,i;
    int sum=0;
    printf("\nEnter n value: ");
    scanf("%d",&n);
    p=(int*)malloc(n*sizeof(int));
    printf("\nMemory Allocated Successfully  using malloc()");
    printf("\nEnter %d Numbers:",n);
    for(i=0;i<n;i++)
    {
        scanf("%d",&p[i]);
        sum=sum+p[i];
    }
    printf("\n Sum  of given %d Numbers is :%d",n,sum);
    free(p);
    printf("\nMemory deallocated using free() function");
    return 0;
}
```

Output:

```
Enter n value: 5

Memory Allocated Successfully  using malloc()
Enter 5 Numbers:
10
11
12
13
14

 Sum  of given 5 Numbers is :60
Memory deallocated using free() function
```

16 b) Write a C Program to calculate the sum of n numbers entered by the user using calloc( ) and free() functions.

https://onlinegdb.com/mjiTNSukX

```c
#include <stdio.h>
#include <stdlib.h>
int main()
{
    int *p;
    int n,i;
    int sum=0;
    printf("\nEnter n value ");
    scanf("%d",&n);
    p=(int*)calloc(n,sizeof(int));
    printf("\nMemory Allocated Successfully  using calloc()");
    printf("\nEnter %d Numbers:",n);
    for(i=0;i<n;i++)
    {
        scanf("%d",&p[i]);
        sum=sum+p[i];
    }
    printf("\n Sum  of given %d Numbers is :%d",n,sum);

    free(p);
    printf("\nMemory deallocated using free() function");
    return 0;
}
```

Output:

```
Enter n value 5

Memory Allocated Successfully  using calloc()
Enter 5 Numbers:
10
20
30
40
50

 Sum  of given 5 Numbers is :150
Memory deallocated using free() function
```