

PPS LAB

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Chapter-1

Question 1)

Aim: Ramesh's basic salary is input through the keyboard. His dearness allowance is 40% of basic salary, and house rent allowance is 20% of basic salary. Write a program to calculate his gross salary.

Program:

```
C GrossSalarycalculator.c > main()
1 #include<stdio.h>
2 int main()
3 {
4     float b,g;
5     printf("Name: Parijat Kumar\nRoll No.: 20001016037\n*****\n");
6     printf("Enter basic salary = ");
7     scanf("%f",&b);
8     g= b+(40*b)/100+(20*b)/100;
9     printf("The Gross Salary is %f",g);
10    return 0;
11 }
12 }
```

Output:

```
Name: Parijat Kumar
Roll No.: 20001016037
*****
Enter basic salary = 2000
The Gross Salary is 3200.000000
```

Question 2)

Aim: The distance between two cities (in km.) is input through the keyboard. Write a program to convert and print this distance in meters, feet, inches and centimeters.

Program:

```
C Distanceconverter.c > main()
1 #include<stdio.h>
2 int main()
3 {
4     float k,m,f,i,c;//k=kilometers, m=meters, f=feet, i=inches, c=centimeters
5     printf("Name: Parijat Kumar\nRoll No.: 20001016037\n*****\n");
6     printf("Enter the distance in kilometers: ");
7     scanf("%f",&k);
8     m=k*1000;
9     c=k*100000;
10    f=k*3280.840000;
11    i=k*39370.100000;
12    printf("The distance in meters is %f",m);
13    printf("\nThe distance in feet is %f",f);
14    printf("\nThe distance in inches is %f",i);
15    printf("\nThe distance in centimeters is %f",c);
16    return 0;
17 }
```

Output:

```
Name: Parijat Kumar
Roll No.: 20001016037
*****
Enter the distance in kilometers: 5
The distance in meters is 5000.000000
The distance in feet is 16404.199219
The distance in inches is 196850.500000
The distance in centimeters is 500000.000000
```

Question 3)

Aim: If the marks obtained by a student in five different subjects are input through the keyboard, find out the aggregate marks and percentage marks obtained by the student. Assume that the maximum marks that can be obtained by a student in each subject is 100.

Program:

```
C Marks%calculator.c > main()
1 #include<stdio.h>
2 int main()
3 {
4     float m1, m2, m3, m4, m5, tm, p;
5     printf("Name: Parijat Kumar\nRoll No.: 20001016037\n*****\n");
6     printf("Enter the marks of first subject: ");
7     scanf("%f",&m1);
8     printf("\nEnter the marks of second subject: ");
9     scanf("%f",&m2);
10    printf("\nEnter the marks of third subject: ");
11    scanf("%f",&m3);
12    printf("\nEnter the marks of fourth subject: ");
13    scanf("%f",&m4);
14    printf("\nEnter the marks of fifth subject: ");
15    scanf("%f",&m5);
16    tm=m1+m2+m3+m4+m5;
17    p= (tm*100)/500;
18    printf("The total marks of the student is %f", tm);
19    printf("\nThe percentage of the student is %f", p);
20
21
22 }
```

Output:

```
Name: Parijat Kumar
Roll No.: 20001016037
*****
Enter the marks of first subject: 96
Enter the marks of second subject: 96
Enter the marks of third subject: 95
Enter the marks of fourth subject: 96
Enter the marks of fifth subject: 97
The total marks of the student is 480.000000
The percentage of the student is 96.000000
```

Question 4)

Aim: Temperature of a city in Fahrenheit degrees is input through the keyboard.
Write a program to convert this temperature into Centigrade degrees.

Program:

```
C temperatureconverter.c > main()
1  #include<stdio.h>
2  int main()
3  {
4      float f,c;
5      printf("Name: Parijat Kumar\nRoll No.: 20001016037\n*****\n");
6      printf("Enter the temperature in Fahrenheit: ");
7      scanf("%f",&f);
8      c= (5*(f-32))/9;
9      printf("The temperature in centigrades is %f",c);
10     return 0;
11 }
```

Output:

```
Name: Parijat Kumar
Roll No.: 20001016037
*****
Enter the temperature in Fahrenheit: -40
The temperature in centigrades is -40.00000
```

Question 5)

Aim: The length & breadth of a rectangle and radius of a circle are input through the keyboard. Write a program to calculate the area & perimeter of the rectangle, and the area & circumference of the circle.

Program:

```
C RectangleandCircle.c > main()
1 #include<stdio.h>
2 int main()
3 {
4     float l,b,r,rectarea,p,cirarea,c;
5     printf("Name: Parijat Kumar\nRoll No.: 20001016037\n*****\n");
6     printf("Enter the length of the rectangle: ");
7     scanf("%f",&l);
8     printf("\nEnter the breadth of the rectangle: ");
9     scanf("%f",&b);
10    printf("\nEnter the radius of the circle: ");
11    scanf("%f",&r);
12    p=2*(l+b);
13    rectarea=l*b;
14    c=(2*22*r)/7;
15    cirarea=(22*r*r)/7;
16    printf("The perimeter of the rectangle is %f", p);
17    printf("\nThe area of the rectangle is %f", rectarea);
18    printf("\nThe circumference of the circle is %f", c);
19    printf("\nThe area of the circle is %f",cirarea);
20
21    return 0;
22 }
```

Output:

```
Name: Parijat Kumar
Roll No.: 20001016037
*****
Enter the length of the rectangle: 2

Enter the breadth of the rectangle: 3

Enter the radius of the circle: 7
The perimeter of the rectangle is 10.000000
The area of the rectangle is 6.000000
The circumference of the circle is 44.000000
The area of the circle is 154.000000
```

Question 6)

Aim: Two numbers are input through the keyboard into two locations C and D. Write a program to interchange the contents of C and D.

Program:

```
C Interchangingvalues2.c > main()
1 #include<stdio.h>
2 int main()
3 {
4     float c,d;
5     printf("Name: Parijat Kumar\nRoll No.: 20001016037\n*****\n");
6     printf("Enter a number: ");
7     scanf("%f",&c);
8     printf("\nEnter another number: ");
9     scanf("%f",&d);
10    printf("\nThe value of C before interchange: %f",c);
11    printf("\nThe value of D before interchange: %f",d);
12    d=c+d;
13    c=d-c;
14    d=d-c;
15    printf("\nThe value of C after interchange: %f",c);
16    printf("\nThe value of D after interchange: %f",d);
17    return 0;
18 }
```

Output:

```
Name: Parijat Kumar
Roll No.: 20001016037
*****
Enter a number: 20

Enter another number: 30

The value of C before interchange: 20.000000
The value of D before interchange: 30.000000
The value of C after interchange: 30.000000
The value of D after interchange: 20.000000
```

Question 7)

Aim: If a five-digit number is input through the keyboard, write a program to calculate the sum of its digits.

(Hint: Use the modulus operator '%')

Program:

```
C Sumofdigitsofnumber.c > main()
1 #include<stdio.h>
2 int main()
3 {
4     int n,d1,d2,d3,d4,d5;
5     int sum=0;
6     printf("Name: Parijat Kumar\nRoll No.: 20001016037\n*****\n");
7     printf("Enter a 5-digit number: ");
8     scanf("%d",&n);
9     d1=n%10;
10    sum=sum+d1;
11    n=n/10;
12    d2=n%10;
13    sum=sum+d2;
14    n=n/10;
15    d3=n%10;
16    sum=sum+d3;
17    n=n/10;
18    d4=n%10;
19    sum=sum+d4;
20    n=n/10;
21    d5=n%10;
22    sum=sum+d5;
23    printf("\nThe sum of digits of the number is %d",sum);
24
25
26 }
```

Output:

```
Name: Parijat Kumar
Roll No.: 20001016037
*****
Enter a 5-digit number: 12345
The sum of digits of the number is 15
```

Question 8)

Aim: If a five-digit number is input through the keyboard, write a program to reverse the number.

Program:

```
C Reversethenumber.c > main()
1 #include<stdio.h>
2 int main()
3 {
4     int n,d1,d2,d3,d4,d5;
5     int rn=0;
6     printf("Name: Parijat Kumar\nRoll No.: 20001016037\n*****\n");
7     printf("Enter a 5 digit number: ");
8     scanf("%d",&n);
9     d1=n%10;
10    rn=rn+(d1*1000);
11    n=n/10;
12    d2=n%10;
13    rn=rn+(d2*1000);
14    n=n/10;
15    d3=n%10;
16    rn=rn+(d3*100);
17    n=n/10;
18    d4=n%10;
19    rn=rn+(d4*10);
20    n=n/10;
21    d5=n%10;
22    rn=rn+(d5*1);
23    printf("\nThe number when reversed is %d",rn);
24    return 0;
25 }
```

Output:

```
Name: Parijat Kumar
Roll No.: 20001016037
*****
Enter a 5 digit number: 12345
The number when reversed is 54321
```

Question 9)

Aim: If a four-digit number is input through the keyboard, write a program to obtain the sum of the first and last digit of this number.

Program:

```
C Sumoffirstandlastdigits.c > main()
1 #include<stdio.h>
2 int main()
3 {
4     int n,f,l,sum;
5     printf("Name: Parijat Kumar\nRoll No.: 20001016037\n*****\n");
6     printf("Enter a 4 digit number: ");
7     scanf("%d",&n);
8     l=n%10;
9     n=n/1000;
10    f=n%10;
11    sum=f+l;
12    printf("\nThe sum of first and last digit of the number is %d", sum);
13
14
15    return 0;
16 }
```

Output:

```
Name: Parijat Kumar
Roll No.: 20001016037
*****
Enter a 4 digit number: 1234

The sum of first and last digit of the number is 5
```

Question 10)

Aim: In a town, the percentage of men is 52. The percentage of total literacy is 48. If total percentage of literate men is 35 of the total population, write a program to find the total number of illiterate men and women if the population of the town is 80,000.

Program:

```
C illiteracyproblem.c > main()
1 #include<stdio.h>
2 int main()
3 {
4     float m,w,lm,lw,l,il,tp;
5     int nilm, nilw;
6     l=48;
7     il=100-l;
8     m=52;
9     w=100-m;
10    lm=35;
11    lw=l-lm;
12    printf("Name: Parijat Kumar\nRoll No.: 20001016037\n*****\n");
13    printf("Enter the population of the town: ");
14    scanf("%f",&tp);
15    nilm=((m*tp)/100)-((lm*tp)/100);
16    nilw=((w*tp)/100)-((lw*tp)/100);
17    printf("\n\nThe number of illiterate men in the town is %d",nilm);
18    printf("\n\nThe number of illiterate women in the town is %d",nilw);
19
20
21    return 0;
22 }
```

Output:

```
Name: Parijat Kumar
Roll No.: 20001016037
*****
Enter the population of the town: 80000

The number of illiterate men in the town is 13600
The number of illiterate women in the town is 28000
```

Question 11)

Aim: A cashier has currency notes of denominations 10, 50 and 100. If the amount to be withdrawn is input through the keyboard in hundreds, find the total number of currency notes of each denomination the cashier will have to give to the withdrawer.

Program:

```
C cashierproblem.c > main()
1 #include<stdio.h>
2 int main()
3 {
4     int n,t,f,h,l;
5     printf("Name: Parijat Kumar\nRoll No.: 20001016037\n*****\n");
6     printf("Enter the amount to be withdrawn in hundreds: ");
7     scanf("%d",&n);
8     h=(n/100);
9     f=((n%100)/50);
10    t=((((n%100)%50)/10);
11
12    printf("\nThe required number of Rs.100 notes is %d",h);
13    printf("\nThe required number of Rs.50 notes is %d",f);
14    printf("\nThe required number of Rs.10 notes is %d",t);
15
16
17    return 0;
18 }
```

Output:

```
Name: Parijat Kumar
Roll No.: 20001016037
*****
Enter the amount to be withdrawn in hundreds: 12345

The required number of Rs.100 notes is 123
The required number of Rs.50 notes is 0
The required number of Rs.10 notes is 4
```

Question 12)

Aim: If the total selling price of 15 items and the total profit earned on them is input through the keyboard, write a program to find the cost price of one item.

Program:

```
C Costprice.c > main()
1 #include<stdio.h>
2 int main()
3 {
4     float cp, tsp, sp, tp, p;
5     printf("Name: Parijat Kumar\nRoll No.: 20001016037\n*****\n");
6     printf("Enter the selling price of 15 items: Rs.");
7     scanf("%f",&tsp);
8     sp=(tsp)/15;
9     printf("\nEnter the total profit earned: Rs.");
10    scanf("%f",&tp);
11    p=(tp)/15;
12    cp=sp-p;
13    printf("\nThe cost price of one item is %f",cp);
14    return 0;
15 }
```

Output:

```
Name: Parijat Kumar
Roll No.: 20001016037
*****
Enter the selling price of 15 items: Rs.1500

Enter the total profit earned: Rs.150

The cost price of one item is 90.000000
```

Question 13)

Aim: If a five-digit number is input through the keyboard, write a program to print a new number by adding one to each of its digits. For example, if the number that is input is 12391 then the output should be displayed as 23402.

Program:

```
C digit+1.c > main()
1 #include<stdio.h>
2 int main()
3 {
4     int n,d1,d2,d3,d4,d5;
5     printf("Name: Parijat Kumar\nRoll No.: 20001016037\n*****\n");
6     printf("Enter a 5-digit number: ");
7     scanf("%d",&n);
8     d1=n%10;
9     n=n/10;
10    d2=n%10;
11    n=n/10;
12    d3=n%10;
13    n=n/10;
14    d4=n%10;
15    n=n/10;
16    d5=n%10;
17    d1=(d1+1)%10;
18    d2=(d2+1)%10;
19    d3=(d3+1)%10;
20    d4=(d4+1)%10;
21    d5=(d5+1)%10;
22    printf("The new number after adding 1 to each digit is %d%d%d%d",d5,d4,d3,d2,d1);
23
24
25    return 0;
26 }
```

Output:

```
Name: Parijat Kumar
Roll No.: 20001016037
*****
Enter a 5-digit number: 12391
The new number after adding 1 to each digit is 23402
```

Question 14)

Aim: Write a program to convert an alphabet input in lower case to upper case.

Program:

```
C uppercase.c > main()
1 #include <stdio.h>
2 int main()
3 {
4     char a;
5     printf("Name: Parijat Kumar\nRoll No.: 20001016037\n*****\n");
6     printf("Enter an alphabet in lower case to convert it into upper case: ");
7     scanf("%c",&a);
8     printf("The alphabet in upper case: %c",a-32);
9
10 }
11 }
```

Output:

```
Name: Parijat Kumar
Roll No.: 20001016037
*****
Enter an alphabet in lower case to convert it into upper case: a
The alphabet in upper case: A
```

Chapter-2

Question-1)

Aim: If cost price and selling price of an item is input through the keyboard, write a program to determine whether the seller has made profit or incurred loss. Also determine how much profit he made or loss he incurred.

Program:

```
C profitloss.c > main()
2 int main()
3 {
4     float sp,cp;
5     printf("Name: Parijat Kumar\nRoll No.:20001016037\n*****\n");
6     printf("Enter the cost price: ");
7     scanf("%f",&cp);
8     printf("Enter the selling price: ");
9     scanf("%f",&sp);
10    if(sp>cp)
11    {
12        printf("\nYou have made a profit of Rs.%f",sp-cp);
13    }
14    else if(cp>sp)
15    {
16        printf("\nYou have made a loss of Rs.%f",cp-sp);
17    }
18    else
19    {
20        printf("\nYou have made neither profit nor loss");
21    }
22    return 0;
23 }
```

Output:

```
Name: Parijat Kumar
Roll No.:20001016037
*****
Enter the cost price: 135
Enter the selling price: 150

You have made a profit of Rs.15.000000
```

Question 2)

Aim: Any integer is input through the keyboard. Write a program to find out whether it is an odd number or even number.

Program:

```
C oddeven.c > ⚙ main()
1  #include<stdio.h>
2  int main()
3  {
4      int n;
5      printf("Name: Parijat Kumar\nRoll No.:20001016037\n*****\n");
6      printf("Enter a number to know whether it is odd or even: ");
7      scanf("%d",&n);
8      if(n%2==0)
9      {
10         printf("The number is even");
11     }
12     else
13     {
14         printf("The number is odd");
15     }
16     return 0;
17 }
```

Output:

```
Name: Parijat Kumar
Roll No.:20001016037
*****
Enter a number to know whether it is odd or even: 7
The number is odd
```

Question 3)

Aim: Any year is input through the keyboard. Write a program to determine whether the year is a leap year or not.

Program:

```
C leapyear.c > main()
1 #include<stdio.h>
2 int main()
3 {
4     int y;
5     printf("Name: Parijat Kumar\nRoll No.:20001016037\n*****\n");
6     printf("Enter the year to know whether it is a leap year: ");
7     scanf("%d",&y);
8     if(y%4==0 && y%100!=0 || y%400==0)
9     {
10         printf("The year %d is a leap year",y);
11     }
12     else
13     {
14         printf("The year %d is not a leap year",y);
15     }
16     return 0;
17 }
18 }
```

Output:

```
Name: Parijat Kumar
Roll No.:20001016037
*****
Enter the year to know whether it is a leap year: 1900
The year 1900 is not a leap year
```

Question 4)

Aim: According to the Gregorian calendar, it was Monday on the date 01/01/1900. If any year is input through the keyboard write a program to find out what is the day on 1st January of this year.

Program:

```
C monday.c > main()
1  #include<stdio.h>
2  int main()
3  {
4      int ref_year = 1900, year, leap = 0, diff, total_days = 0, day = 0;
5      printf("Name: Parijat Kumar\nRoll No.:20001016037\n*****\n");
6      printf("Enter a year between 1900 and 2099\n");
7      scanf("%d", &year);
8      diff = year - ref_year;
9      while(ref_year < year)
10     {
11         if(ref_year % 100 == 0)
12         {
13             if(ref_year % 400 == 0)
14             {
15                 leap++;
16             }
17         }
18         else
19         {
20             if(ref_year % 4 == 0)
21             {
22                 leap++;
23             }
24         }
25         ref_year++;
26     }
27     total_days = (diff - leap) * 365 + leap * 366;
28     day = total_days % 7;
29     printf("\nThe day on 01 January %d was ", year);
30     if(day==0)
31         printf("Monday");
32     else if(day==1)
33         printf("Tuesday");
34     else if(day==2)
35         printf("Wednesday");
36     else if(day==3)
37         printf("Thursday");
38     else if(day==4)
39         printf("Friday");
40     else if(day==5)
41         printf("Saturday");
42     else if(day==6)
43         printf("Sunday");
44     else
45         printf("Wrong Entry");
46     return 0;
47 }
```

Output:

```
Name: Parijat Kumar
Roll No.:20001016037
*****
Enter a year between 1900 and 2099
1901

The day on 01 January 1901 was Tuesday
```

Question 5)

Aim: A five-digit number is entered through the keyboard. Write a program to obtain the reversed number and to determine whether the original and reversed numbers are equal or not.

Program:

```
C 5digitnumberreverse.c > main()
1  #include<stdio.h>
2  int main()
3  {
4      int num, n, r_num=0;
5      printf("Name: Parijat Kumar\nRoll No.:20001016037\n*****\n");
6      printf("Enter a number: ");
7      scanf("%d", &num);
8      n = num;
9      while(num!=0)
10     {
11         r_num = r_num * 10;
12
13         r_num = num % 10 + r_num;
14
15         num = num/10;
16     }
17     printf("Reversed Number of %d is %d\n",n, r_num);
18
19     if (n==r_num)
20         printf("Input Number %d & Reversed Number %d are equal", n, r_num);
21     else
22         printf("Input Number %d & Reversed Number %d are not equal", n, r_num);
23
24     return 0;
25 }
```

Output:

```
Name: Parijat Kumar
Roll No.:20001016037
*****
Enter a number: 1234
Reversed Number of 1234 is 4321
Input Number 1234 & Reversed Number 4321 are not equal
```

Question 6)

Aim: If the ages of Ram, Shyam and Ajay are input through the keyboard, write a program to determine the youngest of the three.

Program:

```
C youngest.c > main()
1 #include<stdio.h>
2 int main()
3 {
4     int ram, shyam, ajay;
5     printf("Name: Parijat Kumar\nRoll No.:20001016037\n*****\n");
6     printf("Enter the age of Ram: ");
7     scanf("%d", &ram);

8
9     printf("Enter the age of Shyam: ");
10    scanf("%d", &shyam);

11
12    printf("Enter the age of Ajay: ");
13    scanf("%d", &ajay);

14
15    if (ram<=shyam)
16    {
17        if(ram<=ajay)
18        {
19            printf("Ram is the Youngest");
20        }
21        else
22        {
23            printf("Ajay is the Youngest");
24        }
25    }
26    else if(shyam<=ajay)
27    {
28        printf("Shyam is the Youngest");
29    }
30    else
31    {
32        printf("Ajay is the Youngest");
33    }
34    return 0;
35 }
```

Output:

```
Name: Parijat Kumar
Roll No.:20001016037
*****
Enter the age of Ram: 10
Enter the age of Shyam: 12
Enter the age of Ajay: 14
Ram is the Youngest
```

Question 7)

Aim: Write a program to check whether a triangle is valid or not, when the three angles of the triangle are entered through the keyboard. A triangle is valid if the sum of all the three angles is equal to 180 degrees.

Program:

```
C triangle.c > main()
1 #include<stdio.h>
2 int main()
3 {
4     int a, b, c, sum;
5     printf("Name: Parijat Kumar\nRoll No.:20001016037\n*****\n");
6     printf("Enter three angles of a triangle: ");
7     scanf("%d %d %d", &a, &b, &c );
8     sum = a+b+c;
9
10    if (sum == 180)
11    {
12        printf("Triangle is valid");
13    }
14    else
15    {
16        printf("Triangle is not valid");
17    }
18    return 0;
19 }
```

Output:

```
Name: Parijat Kumar
Roll No.:20001016037
*****
Enter three angles of a triangle: 30 60 90
Triangle is valid
```

Question 8)

Aim: Find the absolute value of a number entered through the keyboard.

Program:

```
C absolutevalue.c > main()
1  #include<stdio.h>
2  int main()
3  {
4      int n, num;
5      printf("Name: Parijat Kumar\nRoll No.:20001016037\n*****\n");
6      printf("Enter a number: ");
7      scanf("%d", &n);
8      num = n;
9      if(num<0)
10     {
11         num = (-1)*num;
12     }
13     printf("The absolute value of %d is %d", n , num);
14     return 0;
15 }
```

Output:

```
Name: Parijat Kumar
Roll No.:20001016037
*****
Enter a number: -7
The absolute value of -7 is 7
```

Question 9)

Aim: Given the length and breadth of a rectangle, write a program to find whether the area of the rectangle is greater than its perimeter.

Program:

```
C rectangle.c > ⌂ main()
1 #include<stdio.h>
2 int main()
3 {
4     float length, breadth, area, perimeter;
5     printf("Name: Parijat Kumar\nRoll No.:20001016037\n*****\n");
6     printf("Enter the length of rectangle: ");
7     scanf("%f", &length);
8
9     printf("Enter the breadth of rectangle: ");
10    scanf("%f", &breadth);
11
12    area = length * breadth;
13    perimeter = 2 * (length+breadth);
14
15    printf("The area of rectangle: %f\n", area);
16    printf("The perimeter of rectangle: %f\n", perimeter);
17
18    if (area>perimeter)
19    {
20        printf("Area of rectangle is greater than it's perimeter");
21    }
22    else
23    {
24        printf("Perimeter of rectangle is greater than it's area");
25    }
26    return 0;
27 }
```

Output:

```
Name: Parijat Kumar
Roll No.:20001016037
*****
Enter the length of rectangle: 5
Enter the breadth of rectangle: 4
The area of rectangle: 20.000000
The perimeter of rectangle: 18.000000
Area of rectangle is greater than it's perimeter
```

Question 10)

Aim: Given three points (x_1, y_1) , (x_2, y_2) and (x_3, y_3) , write a program to check if all the three points fall on one straight line.

Program:

```
C collinear.c > ⚙ main()
1  #include <stdio.h>
2  int main()
3  {
4      int x1,y1,x2,y2,x3,y3,x4,y4,slope1,slope2;
5      printf("Name: Parijat Kumar\nRoll No.:20001016037\n*****\n");
6      printf("\n Enter 1st co-ordinate (x1,y1) ");
7      scanf("\n %d %d",&x1,&y1);
8      printf("\n Enter 2nd co-ordinate (x2,y2) ");
9      scanf("\n %d %d",&x2,&y2);
10     printf("\n Enter 3rd co-ordinate (x3,y3) ");
11     scanf("\n %d %d",&x3,&y3);
12     slope1=(y2-y1)/(x2-x1);
13     slope2=(y3-y2)/(x3-x2);
14     if(slope1==slope2)
15     {
16         printf("\n Three points fall on the same line");
17     }
18     else
19     {
20         printf("\n Three points doesn't fall on the same line");
21     }
22     return 0;
23 }
```

Output:

```
Name: Parijat Kumar
Roll No.:20001016037
*****
Enter 1st co-ordinate (x1,y1) 1 1
Enter 2nd co-ordinate (x2,y2) 2 2
Enter 3rd co-ordinate (x3,y3) 3 3
Three points fall on the same line
```

Question 11)

Aim: Given the coordinates (x, y) of a center of a circle and it's radius, write a program which will determine whether a point lies inside the circle, on the circle or outside the circle.

Program:

```
C pointandcircle.c > main()
1  #include<stdio.h>
2  #include<math.h>
3  int main()
4  {
5      int x1, y1, x2, y2, radius;
6      float pc;
7      printf("Name: Parijat Kumar\nRoll No.:20001016037\n*****\n");
8      printf("Enter the center co-ordinates of the circle: ");
9      scanf("%d %d", &x1, &y1);
10     printf("Enter the radius of the circle: ");
11     scanf("%d", &radius);
12
13     printf("Enter the point co-ordinates: ");
14     scanf("%d %d", &x2, &y2);
15     pc = sqrt(pow(x2-x1, 2)+pow(y2-y1,2));
16     if(pc>radius)
17     {
18         printf("Point (%d,%d) lies outside the circle.", x2, y2);
19     }
20     else if(pc<radius)
21     {
22         printf("Point (%d,%d) lies inside the circle.", x2, y2);
23     }
24     else if(pc==radius)
25     {
26         printf("Point (%d,%d) lies on the boundary of circle.", x2, y2);
27     }
28     else
29     {
30         printf("Wrong Entry");
31     }
32
33     return 0;
34 }
```

Output:

```
Name: Parijat Kumar
Roll No.:20001016037
*****
Enter the center co-ordinates of the circle: 0 0
Enter the radius of the circle: 7
Enter the point co-ordinates: 4 4
Point (4,4) lies inside the circle.
```

Question 12)

Aim: Given a point (x, y), write a program to find out if it lies on the x-axis, y-axis or at the origin, viz. (0, 0).

Program:

```
C pointongraph.c > main()
1 #include<stdio.h>
2 int main()
3 {
4     float x,y;
5     printf("Name: Parijat Kumar\nRoll No.:20001016037\n*****\n");
6     printf("Enter the coordinates: ");
7     scanf("%f %f",&x,&y);
8     if(x!=0 && y==0)
9     {
10         printf("The point is on x-axis");
11     }
12     else if(x==0 && y!=0)
13     {
14         printf("The point is on y-axis");
15     }
16     else if(x==0 && y==0)
17     {
18         printf("The point is at the origin");
19     }
20     else
21     {
22         printf("The point lies neither on the x-axis nor on the y-axis");
23     }
24
25
26     return 0;
27 }
```

Output:

```
Name: Parijat Kumar
Roll No.:20001016037
*****
Enter the coordinates: 0 7
The point is on y-axis
```

Question 13)

Aim: Any year is entered through the keyboard, write a program to determine whether the year is leap or not. Use the logical operators && and ||.

Program:

```
C leapyear.c > main()
1 #include<stdio.h>
2 int main()
3 {
4     int y;
5     printf("Name: Parijat Kumar\nRoll No.:20001016037\n*****\n");
6     printf("Enter the year to know whether it is a leap year: ");
7     scanf("%d",&y);
8     if(y%4==0 && y%100!=0 || y%400==0)
9     {
10         printf("The year %d is a leap year",y);
11     }
12     else
13     {
14         printf("The year %d is not a leap year",y);
15     }
16     return 0;
17 }
18 }
```

Output:

```
Name: Parijat Kumar
Roll No.:20001016037
*****
Enter the year to know whether it is a leap year: 2021
The year 2021 is not a leap year
```

Question 14)

Aim: Any character is entered through the keyboard, write a program to determine whether the character entered is a capital letter, a small case letter, a digit or a special symbol.

Program:

```
C charactertype.c > main()
1 #include<stdio.h>
2 int main()
3 {
4     char ch;
5     printf("Name: Parijat Kumar\nRoll No.:20001016037\n*****\n");
6     printf("Enter a character = ");
7     scanf("%c",&ch);
8     if(ch>=65 && ch<=90)
9     {
10         printf("%c is an upper case alphabet",ch);
11     }
12     if(ch>=97 && ch<=122)
13     {
14         printf("%c is a lower case alphabet",ch);
15     }
16     if(ch>=47 && ch<=58)
17     {
18         printf("%c is a number",ch);
19     }
20     else if((ch>=0) && (ch<=47) || (ch>=58) && (ch<=64) || (ch>=91) && (ch<=96) || (ch>=123) && (ch<=127))
21     {
22         printf("%c is a special character",ch);
23     }
24     return 0;
25 }
```

Output:

```
Name: Parijat Kumar
Roll No.:20001016037
*****
Enter a character = $
$ is a special character
```

Question 15)

Aim: An Insurance company follows following rules to calculate premium.

- (1) If a person's health is excellent and the person is between 25 and 35 years of age and lives in a city and is a male then the premium is Rs. 4 per thousand and his policy amount cannot exceed Rs. 2 lakhs.
- (2) If a person satisfies all the above conditions except that the sex is female then the premium is Rs. 3 per thousand and her policy amount cannot exceed Rs. 1 lakh.
- (3) If a person's health is poor and the person is between 25 and 35 years of age and lives in a village and is a male then the premium is Rs. 6 per thousand and his policy cannot exceed Rs. 10,000.
- (4) In all other cases the person is not insured.

Write a program to output whether the person should be insured or not, his/her premium rate and maximum amount for which he/she can be insured.

Program:

```
C insuranceproblem.c > main()
1 #include<stdio.h>
2 void main()
3 {
4     int age,premium,max;
5     char health,location,sex;
6     printf("Name: Parijat Kumar\nRoll No.:20001016037\n*****\n");
7     printf("Enter health, age, location & gender of a person: ");
8     scanf(" %c %d %c %c",&health,&age,&location,&sex);
9     if((health=='e')&&(age>=25&&age<=35)&&(location=='c')&&(sex=='m'))
10    {
11        premium=4;
12        max=2;
13        printf("Premium is %d Rs per thousand and the policy amount cannot exceed %d lakhs",premium,max);
14    }
15
16    else if((health=='e')&&(age>=25&&age<=35)&&(location=='c')&&(sex=='f'))
17    {
18        premium=3;
19        max=1;
20        printf("Premium is %d Rs per thousand and the policy amount cannot exceed %d lakhs",premium,max);
21    }
22
23    else if((health=='p')&&(age>=25&&age<=35)&&(location=='v')&&(sex=='m'))
24    {
25        premium=6;
26        max=10000;
27        printf("Premium is %d Rs per thousand and the policy amount cannot exceed Rs. %d ",premium,max);
28    }
29
30    else
31        printf("Person is not insured");
32
33 }
```

Output:

```
Name: Parijat Kumar
Roll No.:20001016037
*****
Enter health, age, location & gender of a person: e 34 c m
Premium is 4 Rs per thousand and the policy amount cannot exceed 2 lakhs
```

Question 16)

Aim: A certain grade of steel is graded according to the following conditions:

- (i) Hardness must be greater than 50
- (ii) Carbon content must be less than 0.7
- (iii) Tensile strength must be greater than 5600

The grades are as follows:

Grade is 10 if all three conditions are met. Grade is 9 if conditions (i) and (ii) are met. Grade is 8 if conditions (ii) and (iii) are met. Grade is 7 if conditions (i) and (iii) are met. Grade is 6 if only one condition is met. Grade is 5 if none of the conditions are met.

Write a program, which will require the user to give values of hardness, carbon content and tensile strength of the steel under consideration and output the grade of the steel.

Program:

```
C steelgrade.c > main()
1 #include<stdio.h>
2 int main()
3 {
4     float h,cc,t;
5     printf("Name: Parijat Kumar\nRoll No.:20001016037\n*****\n");
6     printf("Enter the hardness = ");
7     scanf("%f",&h);
8     printf("Enter the carbon content = ");
9     scanf("%f",&cc);
10    printf("Enter the tensile strength = ");
11    scanf("%f",&t);
12    if(h>50&&cc<0.7&&t>5600)
13    {
14        printf("Grade 10");
15    }
16    else if(h>50&&cc<0.7)
17    {
18        printf("Grade 9");
19    }
20    else if(cc<0.7&&t>5600)
21    {
22        printf("Grade 8");
23    }
24    else if(h>50&&t>5600)
25    {
26        printf("Grade 7");
27    }
28    else if(h>50||cc<0.7||t>5600)
29    {
30        printf("Grade 6");
31    }
32    else if(h<50&&cc>0.7&&t<5600)
33    {
34        printf("Grade 5");
35    }
36 }
37 }
```

Output:

```
Name: Parijat Kumar
Roll No.:20001016037
*****
Enter the hardness = 90
Enter the carbon content = 0.9
Enter the tensile strength = 9000
Grade 7
```

Question 17)

Aim: A library charges a fine for every book returned late. For first 5 days the fine is 50 paise, for 6-10 days fine is one rupee and above 10 days fine is 5 rupees. If you return the book after 30 days your membership will be cancelled. Write a program to accept the number of days the member is late to return the book and display the fine or the appropriate message.

Program:

```
C libraryfine.c > ⚙ main()
1 #include<stdio.h>
2 int main()
3 {
4     int days;
5     float fine;
6     printf("Name: Parijat Kumar\nRoll No.:20001016037\n*****\n");
7     printf("Enter the no. of days: ");
8     scanf("%d",&days);
9     if(days>0 && days<=5)
10    {
11        fine=0.50*days;
12    }
13    else if(days>5 && days<=10)
14    {
15        fine=1*days;
16    }
17    else if(days>10)
18    {
19        fine=5*days;
20
21        if(days>30)
22        {
23            printf("Your membership is cancelled.\n");
24        }
25    }
26    printf("Your fine is Rs.%2f",fine);
27    return 0;
28 }
```

Output:

```
Name: Parijat Kumar
Roll No.:20001016037
*****
Enter the no. of days: 37
Your membership is cancelled.
Your fine is Rs.185.00
```

Question 18)

Aim: If the three sides of a triangle are entered through the keyboard, write a program to check whether the triangle is valid or not. The triangle is valid if the sum of two sides is greater than the largest of the three sides.

Program:

```
C validtriangle.c > main()
1 #include<stdio.h>
2 int main()
3 {
4     int a, b, c;
5     printf("Name: Parijat Kumar\nRoll No.:20001016037\n*****\n");
6     printf("Enter three sides of triangle: \n");
7     scanf("%d %d %d", &a, &b, &c);
8     if ((a + b > c) && (a + c > b) && (b + c > a))
9     {
10         printf("Triangle is valid.");
11     }
12     else
13     {
14         printf("Triangle is not valid.");
15     }
16     return 0;
17 }
```

Output:

```
Name: Parijat Kumar
Roll No.:20001016037
*****
Enter three sides of triangle:
3 4 5
Triangle is valid.
```

Chapter-3

Question 1)

Aim: Write a program to calculate overtime pay of 10 employees. Overtime is paid at the rate of Rs. 12.00 per hour for every hour worked above 40 hours. Assume that employees do not work for fractional part of an hour.

Program:

```
C overtime.c > main()
1 #include<stdio.h>
2 int main()
3 {
4     int n=1,h,o;
5     float p;
6     printf("Name: Parijat Kumar\nRoll No.:20001016037\n*****\n");
7     while(n<=10)
8     {
9         printf("Enter the no. of working hours of employee no.%d: ",n);
10        scanf("%d",&h);
11        if(h>40)
12        {
13            o=h-40;
14            p=12.00*o;
15            printf("The overtime pay is Rs. %f\n",p);
16        }
17        else
18        {
19            printf("No overtime pay\n");
20        }
21        n++;
22    }
23    return 0;
24 }
```

Output:

```
Name: Parijat Kumar
Roll No.:20001016037
*****
Enter the no. of working hours of employee no.1: 35
No overtime pay
Enter the no. of working hours of employee no.2: 36
No overtime pay
Enter the no. of working hours of employee no.3: 37
No overtime pay
Enter the no. of working hours of employee no.4: 38
No overtime pay
Enter the no. of working hours of employee no.5: 39
No overtime pay
Enter the no. of working hours of employee no.6: 40
No overtime pay
Enter the no. of working hours of employee no.7: 41
The overtime pay is Rs. 12.000000
Enter the no. of working hours of employee no.8: 42
The overtime pay is Rs. 24.000000
Enter the no. of working hours of employee no.9: 43
The overtime pay is Rs. 36.000000
Enter the no. of working hours of employee no.10: 44
The overtime pay is Rs. 48.000000
```

Question 2)

Aim: Write a program to find the factorial value of any number entered through the keyboard.

Program:

```
C factorial.c > ...
1 #include<stdio.h>
2 int main()
3 {
4     int n,f=1;
5     printf("Name: Parijat Kumar\nRoll No.:20001016037\n*****\n");
6     printf("Enter a number to find its factorial: ");
7     scanf("%d",&n);
8     for(int i=1;i<=n;i++)
9     {
10         f=f*i;
11     }
12     printf("\nThe factorial of %d is %d",n,f);
13     return 0;
14 }
```

Output:

```
Name: Parijat Kumar
Roll No.:20001016037
*****
Enter a number to find its factorial: 7
The factorial of 7 is 5040
```

Question 3)

Aim: Two numbers are entered through the keyboard. Write a program to find the value of one number raised to the power of another.

Program:

```
C a^b.c > ...
1 #include<stdio.h>
2 int main()
3 {
4     int a,b,r=1;
5     printf("Name: Parijat Kumar\nRoll No.:20001016037\n*****\n");
6     printf("Enter 2 numbers (a,b) to find a^b = ");
7     scanf("%d %d",&a,&b);
8     for(int i=1;i<=b;i++)
9     {
10         r=r*a;
11     }
12     printf("The value of a^b is %d",r);
13     return 0;
14 }
```

Output:

```
Name: Parijat Kumar
Roll No.:20001016037
*****
Enter 2 numbers (a,b) to find a^b = 3 4
The value of a^b is 81
```

Question 4)

Aim: Write a program to print all the ASCII values and their equivalent characters using a while loop. The ASCII values vary from 0 to 255.

Program:

```
C asciivalues.c > ...
1 #include<stdio.h>
2 int main()
3 {
4     printf("Name: Parijat Kumar\nRoll No.:20001016037\n*****\n");
5     for(int i=0;i<=255;i++)
6     {
7         printf("%c = %d ",i,i);
8     }
9     return 0;
10 }
```

Output:

```
Name: Parijat Kumar
Roll No.:20001016037
*****
= 0   = 1   = 2   = 3   = 4   = 5   = 6   = 7   = 8   = 9
= 13   = 14   = 15   = 16   = 17   = 18   = 19   = 20   = 21   = 22   = 23   = 24   = 25   = 26   = 27   = 28   = 29   = 30   = 31   = 32   = 33   = 34   = 35
  = 36   = 37   = 38   = 39   = 40   = 41   = 42   = 43   = 44   = 45   = 46   = 47   = 48   = 49   = 50   = 51   = 52   = 53   = 54   = 55   = 56   = 57   = 58   = 59   = 60   = 61   = 62   = 63   = 64   = 65   = 66   = 67   = 68   = 69   = 70   = 71   = 72   = 73   = 74   = 75   = 76   = 77   = 78   = 79   = 80   = 81   = 82   = 83   = 84   = 85   = 86   = 87   = 88   = 89   = 90   = 91   = 92   = 93   = 94   = 95   = 96   = 97   = 98   = 99   = 100   = 101   = 102   = 103   = 104   = 105   = 106   = 107   = 108   = 109   = 110   = 111   = 112   = 113   = 114   = 115   = 116   = 117   = 118   = 119   = 120   = 121   = 122   = 123   = 124   = 125   = 126   = 127   = 128   = 129   = 130   = 131   = 132   = 133   = 134   = 135   = 136   = 137   = 138   = 139   = 140   = 141   = 142   = 143   = 144   = 145   = 146   = 147   = 148   = 149   = 150   = 151   = 152   = 153   = 154   = 155   = 156   = 157   = 158   = 159   = 160   = 161   = 162   = 163   = 164   = 165   = 166   = 167   = 168   = 169   = 170   = 171   = 172   = 173   = 174   = 175   = 176   = 177   = 178   = 179   = 180   = 181   = 182   = 183   = 184   = 185   = 186   = 187   = 188   = 189   = 190   = 191   = 192   = 193   = 194   = 195   = 196   = 197   = 198   = 199   = 200   = 201   = 202   = 203   = 204   = 205   = 206   = 207   = 208   = 209   = 210   = 211   = 212   = 213   = 214   = 215   = 216   = 217   = 218   = 219   = 220   = 221   = 222   = 223   = 224   = 225   = 226   = 227   = 228   = 229   = 230   = 231   = 232   = 233   = 234   = 235   = 236   = 237   = 238   = 239   = 240   = 241   = 242   = 243   = 244   = 245   = 246   = 247   = 248   = 249   = 250   = 251   = 252   = 253   = 254   = 255
```

Question 5)

Aim: Write a program to print out all Armstrong numbers between 1 and 500. If sum of cubes of each digit of the number is equal to the number itself, then the number is called an Armstrong number.

Program:

```
C armstrongnumbers.c > ...
1 #include<stdio.h>
2 int main()
3 {
4     int n,c=1,r,s;
5     printf("Name: Parijat Kumar\nRoll No.:20001016037\n*****\n");
6     while(c<500)
7     {
8         n=c;
9         s=0;
10        while(n!=0)
11        {
12            r=n%10;
13            s=s+(r*r*r);
14            n=n/10;
15        }
16        if(c==s)
17        {
18            printf("%d is an Armstrong number.\n",c);
19        }
20        c++;
21    }
22    return 0;
23 }
```

Output:

```
Name: Parijat Kumar
Roll No.:20001016037
*****
1 is an Armstrong number.
153 is an Armstrong number.
370 is an Armstrong number.
371 is an Armstrong number.
407 is an Armstrong number.
```

Question 6)

Aim: Write a program for a matchstick game being played between the computer and a user. Your program should ensure that the computer always wins. Rules for the game are as follows:

- There are 21 matchsticks.
- The computer asks the player to pick 1, 2, 3, or 4 matchsticks.
- After the person picks, the computer does its picking.
- Whoever is forced to pick up the last matchstick loses the game.

Program:

```
C matchstickgame.c > main0
1
2 #include<stdio.h>
3 int main()
4 {
5     int m = 21, u, c;
6     printf("Name: Parijat Kumar\nRoll No.:20001016037\n*****\n");
7     while(m>=1)
8     {
9         printf("Total Match Sticks: %d\n", m);
10        printf("Pick up match sticks between (1 to 4): ");
11        scanf("%d", &u);
12
13        if(u>4)
14        {
15            printf("Wrong entry");
16            break;
17        }
18        c = 5 - u;
19        printf("Computer picks up the %d match sticks.\n", c);
20        m = m-u-c;
21        if(m==1)
22        {
23            printf("There is only one matchstick left.");
24            printf("\nYou have lost to the computer.");
25            break;
26        }
27    }
28    return 0;
29 }
```

Output:

```
Name: Parijat Kumar
Roll No.:20001016037
*****
Total Match Sticks: 21
Pick up match sticks between (1 to 4): 4
Computer picks up the 1 match sticks.
Total Match Sticks: 16
Pick up match sticks between (1 to 4): 3
Computer picks up the 2 match sticks.
Total Match Sticks: 11
Pick up match sticks between (1 to 4): 2
Computer picks up the 3 match sticks.
Total Match Sticks: 6
Pick up match sticks between (1 to 4): 1
Computer picks up the 4 match sticks.
There is only one matchstick left.
You have lost to the computer.
```

Question 7)

Aim: Write a program to enter the numbers till the user wants and at the end it should display the count of positive, negative and zeros entered.

Program:

```
C pnz.c > #include<stdio.h>
1  int main()
2  {
3      int num, p=0,n=0,z=0;
4      char choice;
5      printf("Name: Parijat Kumar\nRoll No.:20001016037\n*****\n");
6      do{
7          printf("Enter a number: ");
8          scanf("%d",&num);
9          if(num>0)
10         {
11             p++;
12         }
13     else if(num<0)
14     {
15         n++;
16     }
17     else
18     {
19         z++;
20     }
21     fflush(stdin);
22     printf("Do you want to continue?(y/n)");
23     scanf("%c",&choice);
24     }
25     while(choice=='y');
26     printf("\nNo. of positive entries is %d\nNo. of negative entries is %d\nNo. of zero entries is %d",p,n,z);
27     return 0;
28 }
```

Output:

```
Name: Parijat Kumar
Roll No.:20001016037
*****
Enter a number: 3
Do you want to continue?(y/n)y
Enter a number: 4
Do you want to continue?(y/n)y
Enter a number: -7
Do you want to continue?(y/n)n

No. of positive entries is 2
No. of negative entries is 1
No. of zero entries is 0
```

Question 8)

Aim: Write a program to find the octal equivalent of the entered number.

Program:

```
C octalequivalent.c > main()
1 #include<stdio.h>
2 int main()
3 {
4     int num, r, res=0, oct=0, flag=0;
5     printf("Name: Parijat Kumar\nRoll No.:20001016037\n*****\n");
6     printf("Enter an integer: ");
7     scanf("%d", &num);
8     r = num;
9     while(r!=0)
10    {
11        res = res*10 + r%8;
12        if(res == 0)
13        {
14            flag=1;
15        }
16        r = r/8;
17    }
18    while(res!=0)
19    {
20        oct = oct*10 + res%10;
21        res = res/10;
22    }
23    if (flag == 1)
24    {
25        oct = oct*10;
26    }
27    printf("The octal equivalent of %d is %d.",num, oct);
28    return 0;
29 }
```

Output:

```
Name: Parijat Kumar
Roll No.:20001016037
*****
Enter an integer: 200
The octal equivalent of 200 is 310.
```

Question 9)

Aim: Write a program to find the range of a set of numbers. Range is the difference between the smallest and biggest number in the list.

Program:

```
C rangeofset.c > ...
1 #include<stdio.h>
2 int main()
3 {
4     int s, l, r, n, limit;
5     printf("Name: Parijat Kumar\nRoll No.:20001016037\n*****\n");
6     printf("Enter the limit\n");
7     scanf("%d", &limit);
8     printf("Enter %d numbers\n", limit);
9     scanf("%d", &n);
10    s = l = n;
11    limit = limit - 1;
12    while(limit!=0)
13    {
14        scanf("%d", &n);
15        if(n > l)
16        {
17            l = n;
18        }
19        if(n < s)
20        {
21            s = n;
22        }
23        limit--;
24    }
25    r = l - s;
26    printf("Smallest Number = %d\nLargest Number = %d\n", s, l);
27    printf("Range is %d\n", r);
28    return 0;
29 }
```

Output:

```
Name: Parijat Kumar
Roll No.:20001016037
*****
Enter the limit
4
Enter 4 numbers
-10 -20 40 50
Smallest Number = -20
Largest Number = 50
Range is 70
```

Chapter-4

Question 1)

Aim: Write a menu driven program which has following options:

1. Factorial of a number.
2. Prime or not
3. Odd or even
4. Exit

Program:

```
C menuDrivenprogram.c > main()
1 #include<stdio.h>
2 int main()
3 {
4     int i,n,fact = 1,a,c=2,num,choice;
5     printf("Name: Parijat Kumar\nRoll No.: 20001016037\n*****\n");
6     printf("\n1. Factorial");
7     printf("\n2. Prime");
8     printf("\n3. Odd/Even");
9     printf("\n4. Exit");
10    printf("\nWhat do you choose?\n");
11    scanf("%d",&choice);
12    switch(choice)
13    {
14        case 1:
15            printf("Enter a number to calculate the factorial of that number: \n");
16            scanf("%d", &n);
17            for (i= 1; i <= n; i++)
18            {
19                fact = fact * i;
20            }
21            printf("Factorial of %d = %d\n", n, fact);
22            break;
23        case 2:
24            printf("Enter a number to check if it is prime\n");
25            scanf("%d",&a);
26            for ( c = 2;c<= a-1;c++)
27            {
28                if ( a%c == 0 )
29                {
30                    printf("%d is not prime.\n", a);
31                    break;
32                }
33                if ( c == a)
34                {
35                    printf("%d is prime.\n", a);
36                    break;
37                }
38            }
39        case 3:
40            printf("Enter an integer\n");
41            scanf("%d", &num);
42            if ( num%2 == 0 )
43            {
44                printf("Even\n");
45                break;
46            }
47            else
48            {
49                printf("Odd\n");
50                break;
51            }
52        case 4:
53            printf("You took the exit");
54            break;
55        default:
56            printf("Wrong choice.");
57    }
58 }
59 return 0;
60 }
```

Output:

```
Name: Parijat Kumar
Roll No.: 20001016037
*****
1. Factorial
2. Prime
3. Odd/Even
4. Exit
What do you choose?
1
Enter a number to calculate the factorial of that number:
7
Factorial of 7 = 5040
```

Question 2)

Aim: Write a program which to find the grace marks for a student using switch. The user should enter the class obtained by the student and the number of subjects he has failed in.

- If the student gets first class and the number of subjects, he failed in is greater than 3, then he does not get any grace. If the number of subjects he failed in is less than or equal to 3 then the grace is of 5 marks per subject.
- If the student gets second class and the number of subjects, he failed in is greater than 2, then he does not get any grace. If the number of subjects he failed in is less than or equal to 2 then the grace is of 4 marks per subject.
- If the student gets third class and the number of subjects, he failed in is greater than 1, then he does not get any grace. If the number of subjects he failed in is equal to 1 then the grace is of 5 marks per subject

Program:

```
C gracemarks.c > Q main()
1 #include<stdio.h>
2 int main()
3 {
4     int g, f, grace=0;
5     printf("Name: Parijat Kumar\nRoll No.: 20001016037\n*****\n");
6     printf("Enter the class obtained by the student\n");
7     scanf("%d", &g);
8     printf("How many subjects has the student failed? \n");
9     scanf("%d", &f);
10    switch(g)
11    {
12        case 1:
13        if(f > 3)
14        {
15            grace = 0;
16        }
17        else
18        {
19            grace = 5;
20        }
21        break;
22        case 2:
23        if(f > 2)
24        {
25            grace = 0;
26        }
27        else
28        {
29            grace = 4;
30        }
31        break;
32        case 3:
33        if(f > 1)
34        {
35            grace = 0;
36        }
37        else
38        {
39            grace = 5;
40        }
41        break;
42        default: printf("You entered wrong class for the student\n");
43    }
44    if(g == 1 || g == 2 || g == 3)
45    {
46        printf("The student has obtained a grace marks of %d per subject\n",grace);
47    }
48    return 0;
49 }
```

Output:

```
Name: Parijat Kumar
Roll No.: 20001016037
*****
Enter the class obtained by the student
1
How many subjects has the student failed?
2
The student has obtained a grace marks of 5 per subject
```

Chapter-5

Question 1)

Aim: Write a function to calculate the factorial value of any integer entered through the keyboard.

Program:

```
C factorial.c > ⌂ main()
1 #include<stdio.h>
2 void factorial(int n);
3 int main()
4 {
5     int n;
6     printf("Name: Parijat Kumar\nRoll No.: 20001016037\n*****\n");
7     printf("Enter a number to calculate the factorial of that number: \n");
8     scanf("%d", &n);
9     factorial(n);
10    return 0;
11 }
12 void factorial(int n)
13 {
14     int fact=1;
15     for(int i= 1; i <= n; i++)
16     {
17         fact = fact * i;
18     }
19     printf("Factorial of %d = %d\n", n, fact);
20 }
```

Output:

```
Name: Parijat Kumar
Roll No.: 20001016037
*****
Enter a number to calculate the factorial of that number:
7
Factorial of 7 = 5040
```

Question 2)

Aim: Write a function power (a, b), to calculate the value of a raised to b.

Program:

```
C power.c > main()
1 #include<stdio.h>
2 void power(int a, int b);
3 int main()
4 {
5     int a,b;
6     printf("Name: Parijat Kumar\nRoll No.: 20001016037\n*****\n");
7     printf("Enter values of a and b to find a^b: \n");
8     scanf("%d %d", &a,&b);
9     power(a,b);
10    return 0;
11 }
12 void power(int a, int b)
13 {
14     int r=1;
15     for(int i= 1; i <= b; i++)
16     {
17         r = r*a;
18     }
19     printf("The value of a^b is = %d\n",r);
20 }
```

Output:

```
Name: Parijat Kumar
Roll No.: 20001016037
*****
Enter values of a and b to find a^b:
7 3
The value of a^b is = 343
```

Question 3)

Aim: Write a general-purpose function to convert any given year into its roman equivalent.

Program:

```
C romanequivalent.c > main()
1 #include<stdio.h>
2 void roman(int num)
3 {
4     while(num)
5     {
6         if(num >= 1000)
7         {
8             printf("m");
9             num = num - 1000;
10        }
11        else if(num >= 500)
12        {
13            printf("d");
14            num = num - 500;
15        }
16        else if(num >= 100)
17        {
18            printf("c");
19            num = num - 100;
20        }
21        else if(num >= 50)
22        {
23            printf("l");
24            num = num - 50;
25        }
26        else if(num >= 10)
27        {
28            printf("x");
29            num = num - 10;
30        }
31        else if(num >= 5)
32        {
33            printf("v");
34            num = num - 5;
35        }
36        else if(num >= 1)
37        {
38            printf("i");
39            num = num - 1;
40        }
41    }
42    printf("\n");
43 }
44 int main()
45 {
46     int year;
47     printf("Name: Parijat Kumar\nRoll No.: 20001016037\n*****\n");
48     printf("Enter the year to get its Roman Equivalent \n");
49     scanf("%d", &year);
50     roman(year);
51     return 0;
52 }
```

Output:

```
Name: Parijat Kumar
Roll No.: 20001016037
*****
Enter the year to get its Roman Equivalent
1988
mdccclxxxviii
```

Question 4)

Aim: A positive integer is entered through the keyboard. Write a function to obtain the prime factors of this number.

Program:

```
C primefactors.c > prime(int)
1  #include<stdio.h>
2  void prime(int n);
3  int main()
4  {
5      int n;
6      printf("Name: Parijat Kumar\nRoll No.: 20001016037\n*****\n");
7      printf("Enter an integer: ");
8      scanf("%d", &n);
9      printf("The prime factors are: ");
10     prime(n);
11     return 0;
12 }
13 void prime(int n)
14 {
15     int i;
16     for([i=2;i<=n;i++)]
17     {
18         if(n%[i]==0)
19         {
20             printf("%d ",i);
21             prime(n/i);
22             break;
23         }
24     }
25 }
```

Output:

```
Name: Parijat Kumar
Roll No.: 20001016037
*****
Enter an integer: 35
The prime factors are: 5 7
```

Question 5)

Aim: A 5-digit positive integer is entered through the keyboard, write a function to calculate sum of digits of the 5-digit number:

- 1) Without using recursion 2) Using recursion

Program:

1)

```
C sumofdigitsnonrecursive.c > main()
1 #include<stdio.h>
2 void sumofdigits(int n);
3 int main()
4 {
5     int n;
6     printf("Name: Parijat Kumar\nRoll No.: 20001016037\n*****\n");
7     printf("Enter a number to find the sum of digits: ");
8     scanf("%d",&n);
9     sumofdigits(n);
10    return 0;
11 }
12 void sumofdigits(int n)
13 {
14     int s=0;
15     while(n!=0)
16     {
17         int remainder=n%10;
18         s +=remainder;
19         n=n/10;
20     }
21     printf("The sum of digits = %d",s);
22 }
```

2)

```
C sumofdigitsrecursive.c > main()
1 #include<stdio.h>
2 int sumofdigits(int n);
3 int main()
4 {
5     int n,s;
6     printf("Name: Parijat Kumar\nRoll No.: 20001016037\n*****\n");
7     printf("Enter a number to find the sum of digits: ");
8     scanf("%d",&n);
9     s=sumofdigits(n);
10    printf("The sum of digits is %d",s);
11    return 0;
12 }
13 int sumofdigits(int n)
14 {
15     if (n==0)
16     {
17         return 0;
18     }
19     else
20     {
21         return (n%10+sumofdigits(n/10));
22     }
23 }
```

Output:

1)

```
Name: Parijat Kumar
Roll No.: 20001016037
*****
Enter a number to find the sum of digits: 27
The sum of digits = 9
```

2)

```
Name: Parijat Kumar
Roll No.: 20001016037
*****
Enter a number to find the sum of digits: 27
The sum of digits = 9
```

Question 6)

Aim: Write a recursive function to obtain the first 25 numbers of a Fibonacci sequence.

Program:

```
C fibonacciseries.c > main()
1  #include<stdio.h>
2
3  int fib(int n);
4
5  int main()
6  {
7      int n, i;
8      printf("Name: Parijat Kumar\nRoll No.: 20001016037\n*****\n");
9      printf("Enter no of terms of Fibonacci series to be printed\n");
10     scanf("%d", &n);
11
12     for(i = 1; i <= n; i++)
13     {
14         printf("%d ", fib(i));
15     }
16     return 0;
17 }
18
19 int fib(int n)
20 {
21     if(n == 1)
22     {
23         return 0;
24     }
25     else if(n == 2 || n == 3)
26     {
27         return 1;
28     }
29     else
30     {
31         return( fib(n-1) + fib(n-2) );
32     }
33 }
```

Output:

```
Name: Parijat Kumar
Roll No.: 20001016037
*****
Enter no of terms of Fibonacci series to be printed
25
0 1 1 2 3 5 8 13 21 34 55 89 144 233 377 610 987 1597 2584 4181 6765 10946 17711 28657 46368
```

Question 7)

Aim: A positive integer is entered through the keyboard, write a function to find the binary equivalent of this number using recursion.

Program:

```
C binaryequivalent.c > main()
1 #include<stdio.h>
2 int binary(int);
3 int main()
4 {
5     int n,b;
6     printf("Name: Parijat Kumar\nRoll No.: 20001016037\n*****\n");
7     printf("Enter the number for which you have to find the binary equivalent: ");
8     scanf("%d",&n);
9     b=binary(n);
10    printf("The binary equivalent is %d",b);
11    return 0;
12 }
13 int binary(int n)
14 {
15     if (n==0)
16     {
17         return 0;
18     }
19     else
20     {
21         return (n%2+10*binary(n/2));
22     }
23 }
```

Output:

```
Name: Parijat Kumar
Roll No.: 20001016037
*****
Enter the number for which you have to find the binary equivalent: 15
The binary equivalent is 1111
```

Question 8)

Aim: Write a recursive function to obtain the running sum of first 25 natural numbers.

Program:

```
C sumofnnaturalnos.c > main()
1 #include<stdio.h>
2 int sum(int n);
3 int main()
4 [
5     int n,s;
6     printf("Name: Parijat Kumar\nRoll No.: 20001016037\n*****\n");
7     printf("Enter a number to find sum of first n natural numbers: ");
8     scanf("%d",&n);
9     s=sum(n);
10    printf("The sum of first %d natural numbers: %d",n,s);
11
12    return 0;
13 ]
14 int sum(int n)
15 {
16     if (n==0)
17     {
18         return 0;
19     }
20     else
21     {
22         return (n+sum(n-1));
23     }
24 }
```

Output:

```
Name: Parijat Kumar
Roll No.: 20001016037
*****
Enter a number to find sum of first n natural numbers: 25
The sum of first 25 natural numbers: 325
```

Question 9)

Aim: Write a C function to evaluate the series $\sin(x) = x - (x^3 / 3!) + (x^5 / 5!) - (x^7 / 7!) + \dots$

Program:

```
C sinx.c > ...
1  #include<stdio.h>
2  #include<math.h>
3  double factorial(int);
4  void calc(float, float*); |
5  int main()
6  {
7      int x;
8      float radian, result = 0;
9      printf("Name: Parijat Kumar\nRoll No.: 20001016037\n*****\n");
10     printf("Enter value of x in degrees\n");
11     scanf("%d", &x);
12     radian = x * (3.14159 / 180.0);
13     calc(radian, &result);
14     printf("Sin(%d) = %f\n", x, result);
15     return 0;
16 }
17 void calc(float num, float *res)
18 {
19     int count, n = 1, sign = 1;
20     for(count = 1; (n <= 10); count += 2)
21     {
22         *res += sign * ( pow(num, count) / factorial(count) );
23         n += 1;
24         sign *= -1;
25     }
26 }
27 double factorial(int num)
28 {
29     int count;
30     double sum = 1;
31     for(count = 1; count <= num; count++)
32     {
33         sum *= count;
34     }
35     return(sum);
36 }
```

Output:

```
Name: Parijat Kumar
Roll No.: 20001016037
*****
Enter value of x in degrees
30
Sin(30) = 0.500000
```

Question 10)

Aim: Given three variables x, y, z, write a function to circularly shift their values to right. In other words, if x = 5, y = 8, z = 10 after circular shift y = 5, z = 8 and x = 10. Call the function with variables a, b, c to circularly shift values.

Program:

```
C circularshift.c > main()
1 #include<stdio.h>
2 int shift(int *a, int *b, int *c);
3 int main()
4 {
5     int x, y, z;
6     printf("Name: Parijat Kumar\nRoll No.: 20001016037\n*****\n");
7     printf("Enter x: ");
8     scanf("%d", &x);
9     printf("Enter y: ");
10    scanf("%d", &y);
11    printf("Enter z: ");
12    scanf("%d", &z);
13
14    printf("Before Shift:\nx: %d\ny: %d\nz: %d",x,y,z);
15    shift(&x, &y, &z);
16    printf("\nAfter Shift:\nx: %d\ny: %d\nz: %d",x,y,z);
17    return 0;
18 }
19 int shift(int *a, int *b, int *c)
20 {
21     int temp;
22     temp = *c;
23     *c = *b;
24     *b = *a;
25     *a = temp;
26     return 0;
27 }
```

Output:

```
Name: Parijat Kumar
Roll No.: 20001016037
*****
Enter x: 5
Enter y: 8
Enter z: 10
Before Shift:
x: 5
y: 8
z: 10
After Shift:
x: 10
y: 5
z: 8
```

Question 11)

Aim: If the lengths of the sides of a triangle are denoted by a, b, and c, then area of triangle is given by area = $S(S - a)(S - b)(S - c)$ where, $S = (a + b + c) / 2$.

Program:

```
C herontrianglearea.c > ⌂ area(int, int, int)
1   #include<stdio.h>
2   #include<math.h>
3   int area(int a, int b, int c);
4   int main()
5   {
6       int a, b, c;
7       printf("Name: Parijat Kumar\nRoll No.: 20001016037\n*****\n");
8       printf("Enter a: ");
9       scanf("%d", &a);
10      printf("Enter b: ");
11      scanf("%d", &b);
12      printf("Enter c: ");
13      scanf("%d", &c);
14      area(a,b,c);
15      return 0;
16  }
17  int area(int a, int b, int c)
18  {
19      float s,ar;
20      s = (a+b+c)/2.0;
21      ar = sqrt(s*(s-a)*(s-b)*(s-c));
22      printf("Area of Triangle: %f",ar);
23      return 0;
24 }
```

Output:

```
Name: Parijat Kumar
Roll No.: 20001016037
*****
Enter a: 3
Enter b: 4
Enter c: 5
Area of Triangle: 6.000000
```

Question 12)

Aim: Write a function to compute the distance between two points and use it to develop another function that will compute the area of the triangle whose vertices are A (x₁, y₁), B (x₂, y₂), and C (x₃, y₃). Use these functions to develop a function which returns a value 1 if the point (x, y) lies inside the triangle ABC, otherwise a value 0.

Program:

```
C positionofpoint.c > main()
1 #include<stdio.h>
2 #include<math.h>
3 float d(int, int , int , int);
4 float ar(int, int , int , int , int , int);
5 int main()
6 {
7     int x1,y1,x2,y2,x3,y3,x,y;
8     float A1,A2,A3,A;
9     printf("Name: Parijat Kumar\nRoll No.: 20001016037\n*****\n");
10    printf("Enter the first co-ordinates: ");
11    scanf("%d %d",&x1,&y1);
12    printf("Enter the second co-ordinates: ");
13    scanf("%d %d",&x2,&y2);
14    printf("Enter the third co-ordinates: ");
15    scanf("%d %d",&x3,&y3);
16    printf("Enter the co-ordinates: ");
17    scanf("%d %d",&x,&y);
18    A1=ar(x,y,x2,y2,x3,y3);
19    printf("%f\n",A1);
20    A2=ar(x1,y1,x,y,x3,y3);
21    printf("%f\n",A2);
22    A3=ar(x1,y1,x2,y2,x,y);
23    printf("%f\n",A3);
24    A=ar(x1,y1,x2,y2,x3,y3);
25    printf("%f\n",A);
26    if (A1+A2+A3>A || A1+A2+A3<A )
27    {
28        printf("The point (%d,%d) lies outside the triangle.\n",x,y);
29    }
30    else
31    {
32        printf("The point (%d,%d) lies inside the triangle.\n",x,y);
33    }
34    return 0;
35 }
36 float d(int x1,int y1,int x2,int y2)
37 {
38     float distance;
39     distance=sqrt(pow((x2-x1),2)+pow((y2-y1),2));
40     return (distance);
41 }
42 float ar(int x1,int y1,int x2,int y2,int x3,int y3)
43 {
44     float s,a,b,c,area;
45     a=d(x1,y1,x2,y2);
46     b=d(x2,y2,x3,y3);
47     c=d(x3,y3,x1,y1);
48     s=(a+b+c)/2.0;
49     area= sqrt(s*(s-a)*(s-b)*(s-c));
50     return (area);
51 }
```

Output:

```
Name: Parijat Kumar
Roll No.: 20001016037
*****
Enter the first co-ordinates: 3 0
Enter the second co-ordinates: 0 4
Enter the third co-ordinates: 0 0
Enter the co-ordinates: 1 1
2.000000
1.500000
2.500001
6.000000
The point (1,1) lies outside the triangle.
```

Question 13)

Aim: Write a function to compute the greatest common divisor given by Euclid's algorithm.

Program:

```
C gcd.c > ⊕ gcd(int, int)
1  #include<stdio.h>
2  int gcd(int a, int b);
3  int main()
4  {
5      int a,b;
6      printf("Name: Parijat Kumar\nRoll No.: 20001016037\n*****\n");
7      printf("Enter the value of a: ");
8      scanf("%d", &a);
9      printf("Enter the value of b: ");
10     scanf("%d", &b);
11     printf("Greatest Common Divisor of (%d, %d): %d",a,b,gcd(a,b));
12     return 0;
13 }
14 int gcd(int a, int b)
15 {
16     int temp;
17     while(b != 0)
18     {
19         temp = b;
20         b = a % b;
21         a = temp;
22     }
23     return a;
24 }
```

Output:

```
Name: Parijat Kumar
Roll No.: 20001016037
*****
Enter the value of a: 1980
Enter the value of b: 1617
Greatest Common Divisor of (1980, 1617): 33
```

Chapter-8

Question 1)

Aim: Twenty-five numbers are entered from the keyboard into an array. The number to be searched is entered through the keyboard by the user. Write a program to find if the number to be searched is present in the array and if it is present, display the number of times it appears in the array.

Program:

```
C number.c > ↗ main()
1 #include<stdio.h>
2 int main()
3 [
4     int i,arr[25],prsn=0,num;
5     printf("Name: Parijat Kumar\nRoll No.: 20001016037\n*****\n");
6     printf("\nPlease enter 25 numbers: \n");
7     for(i=0;i<25;i++)
8     {
9         scanf("%d",&arr[i]);
10    }
11    printf("\nPlease enter the number to be searched: \n");
12    scanf("%d",&num);
13    for(i=0;i<25;i++)
14    {
15        if(num==arr[i])
16        {
17            prsn=prsn+1;
18        }
19    }
20    if(prsn==0)
21    {
22        printf("\nNumber does not present in the array.\n");
23    }
24    else
25    {
26        printf("\nNumber is present in the array. \n");
27        printf("\nNumber of times '%d' appears = %d \n",num,prsn);
28    }
29    return 0;
30 ]
```

Output:

```
Name: Parijat Kumar
Roll No.: 20001016037
*****
Please enter 25 numbers:
0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 7 7 7 7 7

Please enter the number to be searched:
7

Number is present in the array.

Number of times '7' appears = 7
```

Question 2)

Aim: Twenty-five numbers are entered from the keyboard into an array. Write a program to find out how many of them are positive, how many are negative, how many are even and how many odd.

Program:

```
C pneo.c > main0
1 #include<stdio.h>
2 int main()
3 {
4     int i,arr[25],tz=0,tp=0,tn=0,te=0,to=0;
5     printf("Name: Parijat Kumar\nRoll No.: 20001016037\n*****\n");
6     printf("\nEnter numbers in the array: \n");
7     for(i=0;i<25;i++)
8     {
9         scanf("%d",&arr[i]);
10        if(arr[i]<0)
11        {
12            tn=tn+1;
13        }
14        if(arr[i]==0)
15        {
16            tz=tz+1;
17        }
18        if(arr[i]>0)
19        {
20            tp=tp+1;
21        }
22        if(arr[i]%2==0)
23        {
24            te=te+1;
25        }
26        if(arr[i]%2!=0)
27        {
28            to=to+1;
29        }
30    }
31    printf("\nTotal zeros = %d\n",tz);
32    printf("\nTotal positive numbers = %d\n",tp);
33    printf("\nTotal negative numbers = %d\n",tn);
34    printf("\nTotal even numbers = %d\n",te);
35    printf("\nTotal odd numbers = %d\n",to);
36    return 0;
37 }
```

Output:

```
Name: Parijat Kumar
Roll No.: 20001016037
*****
Enter numbers in the array:
0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 7 7 7 7 7

Total zeros = 2

Total positive numbers = 23

Total negative numbers = 0

Total even numbers = 10

Total odd numbers = 15
```

Question 3)

Aim: Implement the Selection Sort, Bubble Sort and Insertion sort algorithms on a set of 25 numbers.

Program:

Selection sort

```
C SelectionSort.c >  main()
1  #include <stdio.h>
2  int main()
3  {
4      int i,j,x,min,k;
5      int a[25]={0,1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20,21,22,23,24};
6      printf("Name: Parijat Kumar\nRoll No.: 20001016037\n*****\n");
7      for(i=0;i<25;i++)
8      {
9          min=i;
10         for(j=i+1;j<25;j++)
11         {
12             if(a[min]>a[j])
13             {
14                 min=j;
15             }
16             x=a[min];
17             a[min]=a[j];
18             a[j]=x;
19         }
20         for(k=0;k<25;k++)
21         {
22             printf("%d ",a[k]);
23         }
24         printf("\n");
25     }
26     return 0;
27 }
```

Bubble Sort

```
C BubbleSort.c >  main()
1  #include <stdio.h>
2  int main()
3  {
4      int i,j,x;
5      int a[25]={24,23,22,21,20,19,18,17,16,15,14,13,12,11,10,9,8,7,6,5,4,3,2,1,0};
6      printf("Name: Parijat Kumar\nRoll No.: 20001016037\n*****\n");
7      for(i=0;i<25;i++)
8      {
9          for(j=i+1;j<25;j++)
10         {
11             if(a[i]>a[j])
12             {
13                 x=a[i];
14                 a[i]=a[j];
15                 a[j]=x;
16             }
17         }
18     }
19     int k;
20     for(k=0;k<25;k++)
21     {
22         printf("%d ",a[k]);
23     }
24     printf("\n");
25 }
26 }
```

Insertion Sort

```
C InsertionSort.c > main()
1   #include <stdio.h>
2   int main()
3   {
4       int i,j,key;
5       int a[25]={24,23,22,21,20,19,18,17,16,15,14,13,12,11,10,9,8,7,6,5,4,3,2,1,0};
6       printf("Name: Parijat Kumar\nRoll No.: 20001016037\n*****\n");
7       for(i=1;i<25;i++)
8       {
9           key=a[i];
10          while(i>0 && a[i-1]>key)
11          {
12              j=a[i];
13              a[i]=a[i-1];
14              a[i-1]=j;
15              --i;
16          }
17      }
18      int k;
19      for(k=0;k<25;k++)
20      {
21          printf("%d ",a[k]);
22      }
23      printf("\n");
24      return 0;
25 }
```

Output:

Selection Sort

```
if ($?) { .\SelectionSort }
Name: Parijat Kumar
Roll No.: 20001016037
*****
24 23 22 21 20 19 18 17 16 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0
```

Bubble Sort

```
? { .\BubbleSort }
Name: Parijat Kumar
Roll No.: 20001016037
*****
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
```

Insertion Sort

```
if ($?) { .\InsertionSort }
Name: Parijat Kumar
Roll No.: 20001016037
*****
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
```

Question 4)

Aim: Write a program to implement the procedure called Sieve of Eratosthenes to generate prime numbers from 1 to 100.

Program:

```
C sieveoferatosthenes.c > main()
1 #include<stdio.h>
2 int main()
3 {
4     int i,j,a[100];
5     printf("Name: Parijat Kumar\nRoll No.: 20001016037\n*****\n");
6     for(i=0;i<100;i++)
7     {
8         a[i]=i+1;
9     }
10    printf("\n100 numbers in the array \n");
11    for(i=0;i<100;i++)
12    {
13        printf("%d ",a[i]);
14    }
15    printf("\nAfter using the sieve of eratosthenes \n");
16    for(i=2;i<100;i++)
17    {
18        for(j=2;j<a[i];j++)
19        {
20            if(a[i]%j==0)
21            {
22                a[i]=0;
23            }
24        }
25    }
26    i=a[0];
27    for(;i<100;i++)
28    {
29        printf("%d ",a[i]);
30    }
31    printf("\nPrime numbers are \n");
32    for(i=a[0];i<100;i++)
33    {
34        if(a[i]!=0)
35        {
36            printf("%d ",a[i]);
37        }
38    }
39 }
40 }
```

Output:

```
Name: Parijat Kumar
Roll No.: 20001016037
*****
100 numbers in the array
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55
56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 100
After using the sieve of eratosthenes
2 3 0 5 0 7 0 0 0 11 0 13 0 0 0 17 0 19 0 0 0 23 0 0 0 0 0 29 0 31 0 0 0 0 0 37 0 0 0 41 0 43 0 0 0 47 0 0 0 0 0 53 0 0 0 0 0 59 0 61 0 0 0 0 0 67 0 0 0 71
0 73 0 0 0 0 0 79 0 0 0 0 0 83 0 0 0 0 0 89 0 0 0 0 0 0 97 0 0 0
Prime numbers are
2 3 5 7 11 13 17 19 23 29 31 37 41 43 47 53 59 61 67 71 73 79 83 89 97
```

Question 5)

Aim: Write a program to copy the contents of one array into another in the reverse order.

Program:

```
C reverse.c > main()
1 #include<stdio.h>
2 int main()
3 {
4     int a[10], b[10], i, j;
5     printf("Name: Parijat Kumar\nRoll No.: 20001016037\n*****\n");
6     printf("\nEnter 10 Elements : \n");
7     for (i = 0; i<10; i++)
8     {
9         scanf("%d", &a[i]);
10    }
11    for (i = 0, j = 9; i<10; i++, j--)
12    {
13        b[i] = a[j];
14    }
15    printf("\nArray after copying the contents of one array in reverse order: \n");
16    for (i = 0; i<10; i++)
17    {
18        printf("%d ", b[i]);
19    }
20    return 0;
21 }
```

Output:

```
Name: Parijat Kumar
Roll No.: 20001016037
*****
Enter 10 Elements :
9 8 7 6 5 4 3 2 1 0

Array after copying the contents of one array in reverse order:
0 1 2 3 4 5 6 7 8 9
```

Question 6)

Aim: If an array arr contains n elements, then write a program to check if arr[0] = arr[n-1], arr[1] = arr[n-2] and so on.

Program:

```
C firstandlastequal.c > main()
1 #include<stdio.h>
2 int main()
3 {
4     int n,a,b;
5     printf("Name: Parijat Kumar\nRoll No.: 20001016037\n*****\n");
6     printf("Enter the value of n: ");
7     scanf("%d",&n);
8     int arr[n],i;
9     for(i=0;i<n;i++)
10    scanf("%d",&arr[i]);
11    for(i=0;i<n;i++)
12    {
13        b=i+1;
14        a=n-b;
15        if(arr[i]==arr[a])
16        {
17            printf("arr[%d] = arr[%d-%d] ",i,n,b);
18        }
19    }
20    return 0;
21 }
```

Output:

```
Name: Parijat Kumar
Roll No.: 20001016037
*****
Enter the value of n: 6
1 2 3 3 2 1
arr[0] = arr[6-1] arr[1] = arr[6-2] arr[2] = arr[6-3] arr[3] = arr[6-4] arr[4] = arr[6-5] arr[5] = arr[6-6]
```

Question 7)

Aim: Find the smallest number in an array using pointers.

Program:

```
C smallest.c > main()
1  #include<stdio.h>
2  int main()
3  {
4      int a[5],*s,i,small;
5      s=&a[0];
6      printf("Name: Parijat Kumar\nRoll No.: 20001016037\n*****\n");
7      printf("Enter 5 elements \n");
8      for(i=0;i<5;i++,s++)
9      {
10         |   scanf("%d",s);
11     }
12     s=&a[0];
13     small=*s;
14     for(i=0;i<5;i++,s++)
15     {
16         if(*s<small)
17         {
18             |   small=*s;
19         }
20     }
21 }
```

Output:

```
Name: Parijat Kumar
Roll No.: 20001016037
*****
Enter 5 elements
5 4 3 2 1

Smallest element in the given array is 1
```

Question 8)

Aim: Write a program which performs the following tasks:

- initialize an integer array of 10 elements in main ()
- pass the entire array to a function modify ()
- in modify () multiply each element of array by 3
- return the control to main () and print the new array elements in main ()

Program:

```
C modify.c > main0
1 #include<stdio.h>
2 int modify();
3 int main()
4 {
5     int i,j,a[10]={1,2,3,4,5,6,7,8,9,10};
6     printf("Name: Parijat Kumar\nRoll No.: 20001016037\n*****\n");
7     printf("\nArray before modification \n");
8     for(i=0;i<10;i++)
9     {
10         printf(" %d ",a[i]);
11     }
12     modify(a);
13     printf("\nArray after modification:\n");
14     for(i=0;i<10;i++)
15     {
16         printf(" %d ",a[i]);
17     }
18     return 0;
19 }
20 int modify(int b[10])
21 {
22     int c;
23     for(c=0;c<10;c++)
24     {
25         b[c]=b[c]*3;
26     }
27     return b[c];
28 }
```

Output:

```
Name: Parijat Kumar
Roll No.: 20001016037
*****
Array before modification
 1  2  3  4  5  6  7  8  9  10
Array after modification:
  3   6   9  12  15  18  21  24  27  30
```

Chapter – 9

Question 1)

Aim: Write a program that converts all lowercase characters in a given string to its equivalent uppercase character.

Program:

```
C lowertoupper.c > main()
1 #include<stdio.h>
2 #include<string.h>
3 int main()
4 {
5     char str[70];
6     int i;
7     printf("Name: Parijat Kumar\nRoll No.: 20001016037\n*****\n");
8     printf("\nEnter the string \n");
9     gets(str);
10    for(i=0;i<=strlen(str);i++)
11    {
12        if(str[i]>=97&&str[i]<=122)
13        {
14            str[i]=str[i]-32;
15        }
16    }
17    printf("\nUpper case string is %s\n",str);
18    return 0;
19 }
```

Output:

```
Name: Parijat Kumar
Roll No.: 20001016037
*****


Enter the string
Hello World


Upper case string is HELLO WORLD
```

Question 2)

Aim: Write a program that extracts part of the given string from the specified position.

Program:

```
C extractpartofstring.c > main0
1 #include<stdio.h>
2 int main()
3 {
4     char s[100];
5     int i=0,n, pos;
6     printf("Name: Parijat Kumar\nRoll No.: 20001016037\n*****\n");
7     printf("\nEnter the string \n");
8     gets(s);
9     printf("\nEnter the position to extract from \n");
10    scanf("%d",&pos);
11    printf("\nEnter the number of characters to extract \n");
12    scanf("%d",&n);
13    printf("\n\nExtracted string is \n");
14    if(n==0)
15    {
16        while(s[i]!='\0')
17        {
18            if(i>=pos-1)
19            {
20                printf("%s",s[i]);
21            }
22            i++;
23        }
24    }
25    else
26    {
27        while(s[i]!='\0')
28        {
29            if(i>=pos-1 && i<=pos-1+(n-1))
30            {
31                printf("%c",s[i]);
32            }
33            i++;
34        }
35    }
36 }
```

Output:

```
Name: Parijat Kumar
Roll No.: 20001016037
*****
Enter the string
Working in C is fun

Enter the position to extract from
4

Enter the number of characters to extract
4

Extracted string is
king
```

Question 3)

Aim: Write a program that converts a string like "124" to an integer 124.

Program:

```
C stringtonumber.c > main()
1 #include <stdio.h>
2 #include<string.h>
3 int main()
4 {
5     char str[100];
6     int i, num, fin = 0;
7     printf("Name: Parijat Kumar\nRoll No.: 20001016037\n*****\n");
8     printf("Enter a string of numbers : ");
9     gets(str);
10    for (i = 0; str[i] != '\0'; i++)
11    {
12        num = str[i] - 48;
13        fin = fin * 10 + num;
14    }
15    printf("\nNumber : %d", fin);
16    return 0;
17 }
```

Output:

```
Name: Parijat Kumar
Roll No.: 20001016037
*****
Enter a string of numbers : 124
Number : 124
```

Question 4)

Aim: Write a program that replaces two or more consecutive blanks in a string by a single blank.

Program:

```
C consecutiveblanks.c > main()
1  #include <stdio.h>
2  #include <string.h>
3  int main()
4  {
5      char s[700];
6      int i=0, count=0;
7      printf("Name: Parijat Kumar\nRoll No.: 20001016037\n*****\n");
8      printf("Enter any string: \n");
9      gets(s);
10     while(s[i]!='\0')
11     {
12         if(s[i]==' ')
13         {
14             count++;
15             i++;
16             continue;
17         }
18         if(count>1)
19         {
20             printf(" %c",s[i]);
21             count=0;
22         }
23         else
24         {
25             printf("%c",s[i]);
26         }
27         i++;
28     }
29     return 0;
30 }
```

Output:

```
Name: Parijat Kumar
Roll No.: 20001016037
*****
Enter any string:
Grim    return    to    the    planet    of        apes!!
Grim return to the planet of apes!!
```

Question 5)

Aim: Write a program that uses an array of pointers to strings str []. Receive two strings str1 and str2 and check if str1 is embedded in any of the strings in str []. If str1 is found, then replace it with str2.

```
char *str [] = {"We will teach you how to...",  
"Move a mountain",  
"Level a building",  
"Erase the past",  
"Make a million",  
"...all through C!"};
```

Program:

```
C pointertostrings.c > main()  
1  #include<stdio.h>  
2  #include<string.h>  
3  void replace();  
4  int main()  
5  {  
6      char *str[] = {  
7          "We will teach you how to...",  
8          "Move a mountain",  
9          "Level a building",  
10         "Erase the past",  
11         "Make a million",  
12         "...all through C !"}  
13     };  
14     char str1[80],str2[80];  
15     int i;  
16     printf("Name: Parijat Kumar\nRoll No.: 20001016037\n*****\n");  
17     for(i=0;i<6;i++)  
18     {  
19         printf(" %s\n",*(str+i));  
20     }  
21     printf("Enter the word to search: ");  
22     gets(str1);  
23     printf("\n\nEnter the word to replace: ");  
24     gets(str2);  
25     printf("\nBefore modification:\n\n");  
26     for(i=0;i<6;i++)  
27     {  
28         printf(" %s\n",*(str+i));  
29     }  
30     printf("\nAfter modification:\n\n");  
31     for(i=0;i<6;i++)  
32     {  
33         replace(*(str+i),str1,str2);  
34     }  
35     return 0;  
36 }
```

```

37 void replace(char *s, char s1[80], char s2[80])
38 {
39     int i=0,j=0,k=0;
40     char temp[100],temp2[100],main[100],*t=temp;
41     while(*s]!='\0')
42     {
43         *t=*s;
44         t++;
45         s++;
46     }
47     *t='\0';
48     while(temp[i]!='\0')
49     {
50         temp2[j]=temp[i];
51         if(temp[i]==' ')
52         {
53             temp2[j]='\0';
54             if(strcmpi(temp2,s1)==0)
55             {
56                 strcpy(temp2,s2);
57             }
58             j=0;
59             while(temp2[j]!='\0')
60             {
61                 main[k]=temp2[j];
62                 k++;
63                 j++;
64             }
65             main[k]=' ';
66             k++;
67             j=-1;
68         }
69         i++;
70         j++;
71     }
72     temp2[j]='\0';
73     if(strcmpi(temp2,s1)==0)
74     {
75         strcpy(temp2,s2);
76     }
77     j=0;
78     while(temp2[j]!='\0')
79     {
80         main[k]=temp2[j];
81         k++;
82         j++;
83     }
84     main[k]='\0';
85     printf(" %s\n",main);
86 }

```

Output:

```

Name: Parijat Kumar
Roll No.: 20001016037
*****
We will teach you how to...
Move a mountain
Level a building
Erase the past
Make a million
...all through C !
Enter the word to search: mountain

Enter the word to replace: car

Before modification:

We will teach you how to...
Move a mountain
Level a building
Erase the past
Make a million
...all through C !

After modification:

We will teach you how to...
Move a car
Level a building
Erase the past
Make a million
...all through C !

```

Question 6)

Aim: Write a program to sort a set of names stored in an array in alphabetical order.

Program:

```
C alphabeticalorder.c > ⊕ main()
1 #include<stdio.h>
2 #include<string.h>
3 int main()
4 {
5     int i,j,n;
6     char str[100][100],s[100];
7     printf("Name: Parijat Kumar\nRoll No.: 20001016037\n*****\n");
8     printf("Enter number of names :\n");
9     scanf("%d",&n);
10    printf("Enter names in any order:\n");
11    for(i=0;i<n;i++)
12    {
13        scanf("%s",str[i]);
14    }
15    for(i=0;i<n;i++)
16    {
17        for(j=i+1;j<n;j++)
18        {
19            if(strcmp(str[i],str[j])>0)
20            {
21                strcpy(s,str[i]);
22                strcpy(str[i],str[j]);
23                strcpy(str[j],s);
24            }
25        }
26    }
27    printf("\nThe sorted order of names are:\n");
28    for(i=0;i<n;i++)
29    {
30        printf("%s\n",str[i]);
31    }
32 }
```

Output:

```
Name: Parijat Kumar
Roll No.: 20001016037
*****
Enter number of names :
5
Enter names in any order:
Parijat Aditya Himanshu Tushar Mehak

The sorted order of names are:
Aditya
Himanshu
Mehak
Parijat
Tushar
```

Question 7)

Aim: Develop a program that receives the month and year from the keyboard as integers and prints the calendar.

Program:

```
C calendar.c > main()
1  #include<stdio.h>
2  int leapyear(int year)
3  {
4      if (year % 400 == 0)
5          return 1;
6      if (year % 4 == 0 && year % 100 != 0)
7          return 1;
8      return 0;
9  }
10 int year_days[] = {0,31,28,31,30,31,30,31,31,30,31,30,31};
11 int main()
12 {
13     int days, no_of_leap, yeardif, month, year, oddays, i;
14     month = 1;
15     printf("Name: Parijat Kumar\nRoll No.: 20001016037\n*****\n");
16     printf ("Enter the month and the year: ");
17     scanf ("%d%d", &month, &year);
18     yeardif = year - 1900;
19     no_of_leap = yeardif / 4;
20     if (leapyear(year))
21         no_of_leap--;
22     oddays = no_of_leap * 2;
23     oddays += (yeardif - no_of_leap);
24     for (i=1;i<month;i++)
25     {
26         oddays += year_days[i];
27     }
28     if (leapyear(year) && month >2)
29         oddays++;
30     oddays = oddays % 7;
31     printf ("\n\tMon\tTue\tWed\tThu\tFri\tSat\tSun\n");
32     for (i=0;i<oddays;i++)
33         printf ("    ");
34     if (leapyear(year) && month == 2)
35         days = 29;
36     else
37         days = year_days[month];
38     for (i=1;i<=days;i++)
39     {
40         if ((i+oddays)%7 == 1)
41             printf ("\n");
42         printf ("%9d", i);
43     }
44     return 0;
45 }
```

Output:

```
Name: Parijat Kumar
Roll No.: 20001016037
*****
Enter the month and the year: 8 2021

    Mon      Tue      Wed      Thu      Fri      Sat      Sun
                1
        2      3      4      5      6      7      8
        9      10     11     12     13     14     15
       16     17     18     19     20     21     22
       23     24     25     26     27     28     29
       30     31
```

Question 8)

Aim: Write a program to delete all vowels from a sentence.

Program:

```
C deletethewowels.c > main()
1 #include<stdio.h>
2 #include<string.h>
3 int main()
4 {
5     char line[80],ar[5],newline[80],ch;
6     int i=0,j=0,k=0,count=0;
7     printf("Name: Parijat Kumar\nRoll No.: 20001016037\n*****\n");
8     printf("Enter a sentence:\n");
9     gets(line);
10    while(line[i]!='\0')
11    {
12        ch=line[i];
13        if(ch=='A'||ch=='E'||ch=='I'||ch=='O'||ch=='U'||ch=='a'||ch=='e'||ch=='i'||ch=='o'||ch=='u')
14        {
15            count++;
16        }
17        else
18        {
19            newline[k]=line[i];
20            k++;
21        }
22        i++;
23    }
24    newline[k]='\0';
25    printf("\nNumber of vowels are %d \n",count);
26    printf("\nThe modified line is \n%s",newline);
27
28 }
```

Output:

```
Name: Parijat Kumar
Roll No.: 20001016037
*****
Enter a sentence:
The quick brown fox jumps over the lazy dog

Number of vowels are 11

The modified line is
Th qck brwn fx jmps vr th lzy dg
```

Question 9)

Aim: Write a program that will read a line and delete from it all occurrences of the word ‘the’.

Program:

```
C deletetheword.c > main()
1 #include<stdio.h>
2 #include<string.h>
3 int main()
4 {
5     char string[100];
6     int n,i,c=0,l;
7     printf("Name: Parijat Kumar\nRoll No.: 20001016037\n*****\n");
8     printf("Enter a sentence\n");
9     gets(string);
10    n=strlen(string);
11    for(i=0;i<n;i++)
12    {
13        if(string[i]=='t'&&string[i+1]=='h'&&string[i+2]=='e'&&string[i+3]==' ')
14        {
15            string[i+1]=' ';
16            string[i+2]=' ';
17            string[i+3]=' ';
18        }
19    }
20    for(i=0;i<n;i++)
21    {
22        printf("%c",string[i]);
23    }
24    return 0;
25 }
```

Output:

```
Name: Parijat Kumar
Roll No.: 20001016037
*****
Enter a sentence
The quick brown fox jumps over the lazy dog
The quick brown fox jumps over      lazy dog
```

Question 10)

Aim: Write a program to count the number of occurrences of any two vowels in succession in a line of text.

Program:

```
C vowelsinsuccession.c > main()
1 #include<stdio.h>
2 int main()
3 {
4     char a[700],count=0;
5     printf("Name: Parijat Kumar\nRoll No.: 20001016037\n*****\n");
6     printf("Enter the line: ");
7     gets(a);
8     printf("Two vowels in succession are: ");
9     for(int i=0; a[i]!='\0';i++)
10    {
11        if(a[i]=='a'|| a[i]=='e'|| a[i]=='i'|| a[i]=='o'||a[i]=='u' )
12        {
13            if(a[i+1]=='a'|| a[i+1]=='e'|| a[i+1]=='i'|| a[i+1]=='o'|| a[i+1]=='u')
14            {
15                count++;
16                printf(" %c%c ",a[i],a[i+1]);
17            }
18        }
19    }
20    printf("\nNo. of occurrences of two vowels in succession = %d\n ",count);
21    return 0;
22 }
```

Output:

```
Name: Parijat Kumar
Roll No.: 20001016037
*****
Enter the line: Please read this application and give me gratuity
Two vowels in succession are: ea ea io ui
No. of occurrences of two vowels in succession = 4
```

Chapter-10

Question 1)

Aim: Create a structure to specify data of customers in a bank. The data to be stored is: Account number, Name, Balance in account. Assume maximum of 200 customers in the bank.

(a) Write a function to print the Account number and name of each customer with balance below Rs. 100.

(b) If a customer request for withdrawal or deposit, it is given in the form:

Acct. no, amount, code (1 for deposit, 0 for withdrawal). Write a program to give a message, "The balance is insufficient for the specified withdrawal".

Program:

```
C accounts.c > main()
1 #include<stdio.h>
2 int action(int, int, int);
3 int below100();
4 struct acc_holder
5 {
6     long int acc_num;
7     char name[30];
8     int bal;
9 }
10 sba[200] = {
11 1, "Aditya", 17042001,
12 2, "Himanshu", 12092001,
13 3, "Tushar", 18072002,
14 4, "Mehak", 13072002,
15 5, "Parijat", 7};
16 int main()
17 {
18     printf("Name: Parijat Kumar\nRoll No.: 20001016037\n*****\n");
19     int accnum, amount, code;
20     printf("\nEnter your account number : ");
21     scanf("%d", &accnum);
22     printf("Enter 1 for deposit and 0 for withdrawal : ");
23     scanf("%d", &code);
24     if (code==1)
25     {
26         printf("\nEnter amount to be deposit : ");
27         scanf("%d", &amount);
28     }
29     else if(code==0)
30     {
31         printf("\nEnter amount to withdraw : ");
32         scanf("%d", &amount);
33     }
34     else
35     {
36         printf("Enter a valid number.");
37     }
38     action(accnum, amount, code);
39     printf("All members with account balance less than 100 are following : \n");
40     below100();
41     return 0;
42 }
```

```

43 int below100()
44 {
45     int i;
46     for (i = 0; i < 200; i++)
47     {
48         if (sbi[i].bal < 100 && sbi[i].bal > 0)
49         {
50             printf("\nName : %s\n", sbi[i].name);
51             printf("\nAccount Number : %d\n", sbi[i].acc_num);
52         }
53     }
54     return 0;
55 }
56 int action(int accnum, int amount, int code)
57 {
58     int i;
59     for (i = 0; i < 200; i++)
60         if (sbi[i].acc_num == accnum)
61             break;
62     if (!code)
63     {
64         if (sbi[i].bal - amount < 100)
65         {
66             printf("\nThe balance is insufficient for the specified withdrawal\n");
67         }
68         else
69         {
70             sbi[i].bal -= amount;
71             printf("\nYour new account balance is : %d\n", sbi[i].bal);
72         }
73     }
74     else
75     {
76         sbi[i].bal += amount;
77         printf("\nYour new account balance is : %d\n", sbi[i].bal);
78     }
79     return 0;
80 }

```

Output:

```

Name: Parijat Kumar
Roll No.: 20001016037
*****
Enter your account number : 5
Enter 1 for deposit and 0 for withdrawal : 0

Enter amount to withdraw : 100

The balance is insufficient for the specified withdrawal
All members with account balance less than 100 are following :

Name : Parijat

Account Number : 5

```

Question 2)

An automobile company has serial number for engine parts starting from AA0 to FF9. The other characteristics of parts to be specified in a structure are: Year of manufacture, material and quantity manufactured.

(a) Specify a structure to store information corresponding to a part.

(b) Write a program to retrieve information on parts with serial numbers between BB1 and CC6.

Program:

```
C automobile.c > main()
1  #include<stdio.h>
2  void eng_info(char*, char*);
3  struct engine
4  {
5      char serial[4];
6      int yom;
7      char mat[50];
8      int quantity;
9  }
10 maruti[10] = { "AA0", 2005, "Iron", 20,
11 "BB1", 2007, "Steel", 13,
12 "BB2", 1992, "Aluminium", 57,
13 "CC1", 2005, "Stainless Steel", 7,
14 "CC6", 2007, "Steel", 34,
15 "CC7", 2010, "Steel", 14
16 };
17 int main()
18 {
19     char from[5], to[5];
20     printf("Name: Parijat Kumar\nRoll No.: 20001016037\n*****\n");
21     printf("\nEnter the serial number, from where you want to start the list : ");
22     scanf("%s", from);
23     printf("\nEnter the serial at which you wan to end the list : ");
24     scanf("%s", to);
25     eng_info(from, to);
26     return 0;
27 }
28
29 void eng_info(char *from, char *to)
30 {
31     char first_letter;
32     int last_digit;
33     int i;
34     printf("\n\tEngines Information\n");
35     for (i = 0; maruti[i].serial[0] != *from; i++);
36     while (1)
37     {
38         printf("\nSerial Number : %s", maruti[i].serial);
39         printf("\nYear Of Manufacture : %d", maruti[i].yom);
40         printf("\nMaterial Used : %s", maruti[i].mat);
41         printf("\nQuantity : %d\n", maruti[i].quantity);
42         if (i == 10)
43             i = 0;
44         i++;
45         if (maruti[i].serial[0] == *to && maruti[i].serial[2] == *(to + 2))
46         {
47             printf("\nSerial Number : %s", maruti[i].serial);
48             printf("\nYear Of Manufacture : %d", maruti[i].yom);
49             printf("\nMaterial Used : %s", maruti[i].mat);
50             printf("\nQuantity : %d\n", maruti[i].quantity);
51             return;
52         }
53     }
54 }
```

Output:

```
Name: Parijat Kumar  
Roll No.: 20001016037  
*****
```

```
Enter the serial number, from where you want to start the list : BB1
```

```
Enter the serial at which you wan to end the list : CC6
```

Engines Information

```
Serial Number : BB1  
Year Of Manufacture : 2007  
Materail Used : Steel  
Quantity : 13
```

```
Serial Number : BB2  
Year Of Manufacture : 1992  
Materail Used : Aluminium  
Quantity : 57
```

```
Serial Number : CC1  
Year Of Manufacture : 2005  
Materail Used : Stainless Steel  
Quantity : 7
```

```
Serial Number : CC6  
Year Of Manufacture : 2007  
Materail Used : Steel  
Quantity : 34
```

Question 3)

Aim: There is a structure called employee that holds information like employee code, name, date of joining. Write a program to create an array of the structure and enter some data into it. Then ask the user to enter current date. Display the names of those employees whose tenure is 3 or more than 3 years according to the given current date.

Program:

```
C employee.c > ...
1  #include<stdio.h>
2  #include<string.h>
3  int main()
4  {
5      struct employee
6      {
7          char name[40];
8          int code,doj,moj,yoj;
9      };
10     struct employee e[3];
11     int i,d,m,y,yr;
12     printf("Name: Parijat Kumar\nRoll No.: 20001016037\n*****\n");
13     for(i=0;i<3;i++)
14     {
15         printf("Enter employee code: \n");
16         scanf("%d",&e[i].code);
17         fflush(stdin);
18         printf("Enter employee name: \n");
19         gets(e[i].name);
20         printf("Enter date of joining in dd/mm/yy format \n");
21         scanf("%d/%d/%d",&e[i].doj,&e[i].moj,&e[i].yoj);
22         printf("Enter current date dd/mm/yy format\n");
23         scanf("%d/%d/%d",&d,&m,&y);
24         yr=y-e[i].yoj;
25         if(yr>3)
26         {
27             printf("%s \n",e[i].name);
28             continue;
29         }
30         if(yr==3)
31         {
32             if(e[i].moj>m)
33             {
34                 printf("%s \n",e[i].name);
35                 continue;
36             }
37         }
38         if(e[i].moj==m)
39         {
40             if(e[i].doj>=d)
41             {
42                 printf("%s \n",e[i].name);
43             }
44         }
45     }
46     return 0;
47 }
```

Output:

```
Name: Parijat Kumar
Roll No.: 20001016037
*****
Enter employee code:
1
Enter employee name:
Parijat Kumar
Enter date of joining in dd/mm/yy format
07/12/2001
Enter current date dd/mm/yy format
09/08/2021
Parijat Kumar
Enter employee code:
■
```

Question 4)

Aim: Write a menu driven program that depicts the working of a library. The menu options should be:

1. Add book information
2. Display book information
3. List all books of given author
4. List the title of specified book
5. List the count of books in the library
6. List the books in the order of accession number
7. Exit

Create a structure called library to hold accession number, title of the book, author name, price of the book, and flag indicating whether book is issued or not.

Program:

```
C library.c > main()
1  #include<stdio.h>
2  int main()
3  {
4      struct lib
5      {
6          int accession,flag;
7          float price;
8          char name[20],authname[20];
9      };
10     struct lib l[20];
11     int ch,i=0,acc,j=0,x;
12     char author[20];
13     printf("Name: Parijat Kumar\nRoll No.: 20001016037\n*****\n");
14     while(x!=1)
15     {
16         printf("What do u want to do? \n");
17         printf("1.Add book information \n");
18         printf("2.Display book information \n");
19         printf("3.List all books of given author \n");
20         printf("4.List the title of specified book \n");
21         printf("5.List the count of books in the library \n");
22         printf("6.List the books in the order of accession no. \n");
23         printf("7.Exit\n");
24         scanf("%d",&ch);
25         switch(ch)
26         {
27             case 1:
28             {
29                 printf("Enter the name of the book: \n");
30                 fflush(stdin);
31                 gets(l[j].name);
32                 printf("Enter the author name: \n");
33                 fflush(stdin);
34                 gets(l[j].authname);
35                 printf("Enter the price of the book: \n");
36                 scanf("%f",&l[j].price);
37                 printf("press 0 if book is issued and 1 if it is available: \n");
38                 scanf("%d",&l[j].flag);
39                 printf("Record added successfully\n");
40                 l[j].accession=j;
41                 j++;
42                 break;
43             }
44             case 2:
45             {
46                 for(i=0;i<j;i++)
47                     puts(l[i].name);
48                     printf(" ");
49                     puts(l[i].authname);
50                     printf("%f ",l[i].price);
51                     if(l[i].flag==0)
52                         printf("Book is available\n");
53                     else
54                         printf("Book is not available\n");
55                     break;
56             }
57         }
58     }
59 }
```

```
57     case 3:
58     {
59         printf("Enter the name of author\n");
60         gets(author);
61         for(i=0;i<j;i++)
62         {
63             if(l[i].authname==author)
64             {
65                 puts(l[i].name);
66                 printf("\n");
67             }
68             break;
69         }
70     }
71     case 4:
72     {
73         printf("Enter the accession no. of the book\n");
74         scanf("%d",&acc);
75         for(i=0;i<j;i++)
76             if(l[i].accession==acc)
77             {
78                 puts(l[i].name);
79                 printf("\n");
80             }
81             break;
82     }
83     case 5:
84     {
85         printf("%d",j);
86         break;
87     }
88     case 6:
89     {
90         for(i=0;i<j;i++)
91         {
92             puts(l[i].name);
93             printf("\n");
94         }
95         break;
96     }
97     case 7:
98     {
99         x=2;
100        break;
101    }
102}
103}
104 return 0;
105 }
```

Output:

```
Name: Parijat Kumar
Roll No.: 20001016037
*****
What do u want to do?
1.Add book information
2.Display book information
3.List all books of given author
4.List the title of specified book
5.List the count of books in the library
6.List the books in the order of accession no.
7.Exit
1
Enter the name of the book:
Let Us C
Enter the author name:
Yashwant Kanetkar
Enter the price of the book:
700
press 0 if book is issued and 1 if it is available:
1
Record added successfully
What do u want to do?
1.Add book information
2.Display book information
3.List all books of given author
4.List the title of specified book
5.List the count of books in the library
6.List the books in the order of accession no.
7.Exit
```

Question 5)

Aim: Write a program that compares two given dates. To store date use structure say date that contains three members namely date, month and year. If the dates are equal then display message as "Equal" otherwise "Unequal".

Program:

```
C date.c > ...
1 #include<stdio.h>
2 struct date
3 {
4     int day;
5     int month;
6     int year;
7 };
8 int main()
9 {
10    struct date d1,d2;
11    printf("Name: Parijat Kumar\nRoll No.: 20001016037*****\n");
12    printf("Enter first date in the dd/mm/yyyy format: \n");
13    scanf("%d/%d/%d",&d1.day,&d1.month,&d1.year);
14    printf("\nEnter second date in the dd/mm/yyyy format: \n");
15    scanf("%d/%d/%d",&d2.day,&d2.month,&d2.year);
16    if((d1.day==d2.day)&&(d1.month==d2.month)&&(d1.year==d2.year))
17    {
18        printf("\nEQUAL");
19    }
20    else
21    {
22        printf("\nUNEQUAL");
23    }
24    return 0;
25 }
```

Output:

```
Name: Parijat Kumar
Roll No.: 20001016037
*****
Enter first date in the dd/mm/yyyy format:
07/12/2001

Enter second date in the dd/mm/yyyy format:
07/12/2001

EQUAL
```

Question 6)

Aim: Write a program to implement a stack using a linked list.

Program:

```
C Q9.c > ↻ main()
1  #include<stdio.h>
2  #include <stdlib.h>
3  void push();
4  void pop();
5  void display();
6  struct node
7  {
8      int val;
9      struct node *next;
10 };
11 struct node *head;
12 int main ()
13 {
14     int choice=0;
15     printf("Name: Parijat Kumar\nRoll No.: 20001016037\n*****\n");
16     printf("\n*****Stack operations using linked list*****\n");
17     printf("\n-----\n");
18     while(choice != 4)
19     {
20         printf("\n\nChose one from the below options...\n");
21         printf("\n1.Push\n2.Pop\n3.Show\n4.Exit");
22         printf("\nEnter your choice \n");
23         scanf("%d",&choice);
24         switch(choice)
25         {
26             case 1:
27             {
28                 push();
29                 break;
30             }
31             case 2:
32             {
33                 pop();
34                 break;
35             }
36             case 3:
37             {
38                 display();
39                 break;
40             }
41             case 4:
42             {
43                 printf("Exiting....");
44                 break;
45             }
46             default:
47             {
48                 printf("Please Enter valid choice.\n");
49             }
50         };
51     }
52     return 0;
53 }
```

```
54     void push ()
55     {
56         int val;
57         struct node *ptr = (struct node*)malloc(sizeof(struct node));
58         if(ptr == NULL)
59         {
60             printf("not able to push the element");
61         }
62         else
63         {
64             printf("Enter the value\n");
65             scanf("%d",&val);
66             if(head==NULL)
67             {
68                 ptr->val = val;
69                 ptr -> next = NULL;
70                 head=ptr;
71             }
72             else
73             {
74                 ptr->val = val;
75                 ptr->next = head;
76                 head=ptr;
77             }
78         }
79         printf("Item pushed");
80     }
81     }
82 }
83 void pop()
84 {
85     int item;
86     struct node *ptr;
87     if (head == NULL)
88     {
89         printf("Underflow\n");
90     }
91     else
92     {
93         item = head->val;
94         ptr = head;
95         head = head->next;
96         free(ptr);
97         printf("Item popped\n");
98     }
99 }
```

```
100 void display()
101 {
102     int i;
103     struct node *ptr;
104     ptr=head;
105     if(ptr == NULL)
106     {
107         printf("Stack is empty\n");
108     }
109     else
110     {
111         printf("Printing Stack elements \n");
112         while(ptr!=NULL)
113         {
114             printf("%d\n",ptr->val);
115             ptr = ptr->next;
116         }
117     }
118 }
```

Output:

```
Name: Parijat Kumar
Roll No.: 20001016037
*****
*****Stack operations using linked list*****
-----
Chose one from the below options...
1.Push
2.Pop
3.Show
4.Exit
Enter your choice
1
Enter the value
90
Item pushed

Chose one from the below options...
1.Push
2.Pop
3.Show
4.Exit
Enter your choice
```

Question 7)

Aim: Write a program to implement a queue using a linked list.

Program:

```
C Q10.c > main()
1 #include<stdio.h>
2 #include<stdlib.h>
3 struct node
4 {
5     int data;
6     struct node *next;
7 };
8 struct node *front;
9 struct node *rear;
10 void insert();
11 void delete();
12 void display();
13 int main ()
14 {
15     int choice;
16     printf("Name: Parijat Kumar\nRoll No.: 20001016037\n*****\n");
17     while(choice != 4)
18     {
19         printf("\n*****Main Menu*****\n");
20         printf("=====\n");
21         printf("\n1.insert an element\n2.Delete an element\n3.Display the queue\n4.Exit\n");
22         printf("\nEnter your choice ?\n");
23         scanf("%d",& choice);
24         switch(choice)
25         {
26             case 1:
27                 insert();
28                 break;
29             case 2:
30                 delete();
31                 break;
32             case 3:
33                 display();
34                 break;
35             case 4:
36                 exit(0);
37                 break;
38             default:
39                 printf("\nPlease enter a valid number.\n");
40         }
41     }
42     return 0;
43 }
44 void insert()
45 {
46     struct node *ptr;
47     int item;
48
49     ptr = (struct node *) malloc (sizeof(struct node));
50     if(ptr == NULL)
51     {
52         printf("\nOVERFLOW\n");
53         return;
54     }
```

```
55     else
56     {
57         printf("\nEnter value?\n");
58         scanf("%d",&item);
59         ptr -> data = item;
60         if(front == NULL)
61         {
62             front = ptr;
63             rear = ptr;
64             front -> next = NULL;
65             rear -> next = NULL;
66         }
67         else
68         {
69             rear -> next = ptr;
70             rear = ptr;
71             rear->next = NULL;
72         }
73     }
74 }
75 void delete ()
76 {
77     struct node *ptr;
78     if(front == NULL)
79     {
80         printf("\nUNDERFLOW\n");
81         return;
82     }
83     else
84     {
85         ptr = front;
86         front = front -> next;
87         free(ptr);
88     }
89 }
90 void display()
91 {
92     struct node *ptr;
93     ptr = front;
94     if(front == NULL)
95     {
96         printf("\nEmpty queue\n");
97     }
98     else
99     {
100         printf("\nprinting values ..... \n");
101         while(ptr != NULL)
102         {
103             printf("\n%d\n",ptr -> data);
104             ptr = ptr -> next;
105         }
106     }
}
```

Output:

```
Name: Parijat Kumar
Roll No.: 20001016037
*****
*****Main Menu*****
=====
1.insert an element
2.Delete an element
3.Display the queue
4.Exit

Enter your choice ?
1

Enter value?
90

*****Main Menu*****
```

Chapter-12&13(File Handling)

Question 1)

Aim: Write a program to read a file and display contents with its line numbers.

Program:

```
C fileopen.c > main()
1 #include<stdio.h>
2 main()
3 {
4     FILE *fs;
5     char ch;
6     int i=1;
7     fs=fopen("hello.c","r");
8     printf("Name: Parijat Kumar\nRoll No.: 20001016037\n*****\n");
9     if(fs==NULL)
10    {
11        printf("can't open source file");
12        exit(1);
13    }
14    printf("%d",i++);
15    while(1)
16    {
17        ch=fgetc(fs);
18        if(ch==EOF)
19        {
20            break;
21        }
22        printf("%c",ch);
23        if(ch=='\n')
24        {
25            printf("%d",i);
26            i++;
27        }
28    }
29    fclose(fs);
30 }
```

Output:

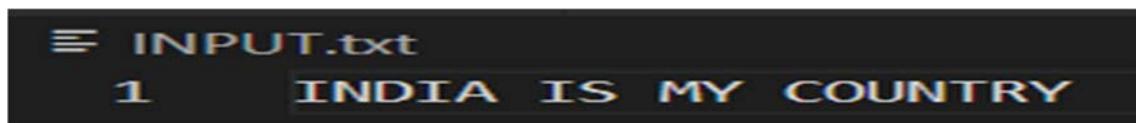
```
Name: Parijat Kumar
Roll No.: 20001016037
*****
1#include<stdio.h>
2int main()
3{
4    printf("Hello World\n");
5    return 0;
6}
```

Question 2)

Aim: Write a program to find the size of a text file without traversing it character by character.

Program:

```
C sizeoffile.c > ...
1 #include<stdio.h>
2 #include<string.h>
3 int main()
4 {
5     FILE *fp;
6     char s[80],ch;
7     int len=0;
8     fp=fopen("input.txt", "r");
9     printf("Name: Parijat Kumar\nRoll No.: 20001016037\n*****\n");
10    while(fgets(s,79,fp)!=NULL)
11    {
12        len=len+strlen(s);
13    }
14    fclose(fp);
15    printf("Length of given file is %d",len);
16    return 0;
17 }
```



Output:

```
Name: Parijat Kumar
Roll No.: 20001016037
*****
Length of given file is 19
```

Question 3)

Aim: Write a program to add the contents of one file at the end of another.

Program:

```
C fileadd.c > main()
1 #include<stdio.h>
2 int main()
3 {
4     FILE *f1,*f2;
5     char ch;
6     f1=fopen("FILE1.TXT","r");
7     f2=fopen("FILE2.TXT","a+");
8     printf("Name: Parijat Kumar\nRoll No.: 20001016037\n*****\n");
9     if(f1==NULL || f2==NULL)
10    {
11        printf("\ncannot open one of files!");
12    }
13    while(1)
14    {
15        ch=fgetc(f1);
16        if(ch==EOF)
17        {
18            break;
19        }
20        fputc(ch,f2);
21    }
22    fclose(f1);
23    fclose(f2);
24    printf("\nTask completed successfully!");
25    return 0;
26 }
```

≡ FILE1.txt
1 The text of file 1

≡ FILE2.txt
1 The text of file 2

Output:

```
Name: Parijat Kumar
Roll No.: 20001016037
*****
Task completed successfully!
```

≡ FILE2.txt
1 The text of file 2The text of file 1

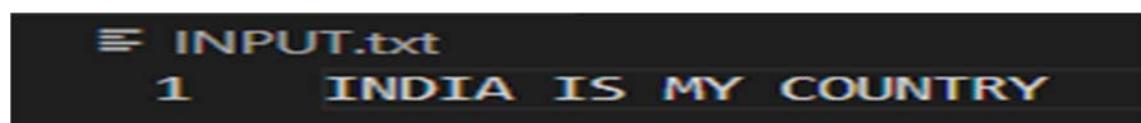
Question 4)

Aim: Write a program to carry out the following:

- (a) Read a text file 'INPUT.TXT'
- (b) Print each word in reverse order

Program:

```
C Q7.c > main()
1  #include<stdio.h>
2  #include<string.h>
3  int main()
4  {
5      printf("Name: Parijat Kumar\nRoll No.: 20001016037\n*****\n");
6      FILE *fs;
7      char s[80];
8      void rev();
9      fs=fopen("INPUT.TXT","r");
10     if(fs==NULL)
11     {
12         printf("File cannot be opened.");
13     }
14     while(fgets(s,79,fs)!=NULL)
15     {
16         rev(s);
17     }
18 }
19 void rev(char s1[80])
20 {
21     char s2[80];
22     int i=0,j=0;
23     while(s1[i]!='\0')
24     {
25         s2[j]=s1[i];
26         if(s1[i]==' ' || s1[i]=='\0')
27         {
28             s2[j]='\0';
29             strrev(s2);
30             printf("%s ",s2);
31             j=-1;
32         }
33         i++;
34         j++;
35     }
36     s2[j]='\0';
37     printf("%s",strrev(s2));
38 }
```



Output:

```
Name: Parijat Kumar
Roll No.: 20001016037
*****
AIDNI SI YM YRTNUOC
```

Question 5)

Aim: Given a text file, write a program to create another text file deleting the words "a", "the", "an" and replacing each one of them with a blank space.

Program:

```
C Q8.c > replace(char *, char *)
1  #include<stdio.h>
2  #include<string.h>
3  void replace();
4  int main()
5  {
6      printf("Name: Parijat Kumar\nRoll No.: 20001016037\n*****\n");
7      FILE *fp,*ft;
8      char str[80],target[80];
9      fp=fopen("FILE.TXT","r");
10     if(fp==NULL)
11     {
12         puts("Source file cannot be opened.");
13     }
14     ft=fopen("NEW.TXT","w");
15     if(ft==NULL)
16     {
17         puts("Target file cannot be opened.");
18     }
19     while(fgets(str,79,fp)!=NULL)
20     {
21         replace(str,&target);
22         fputs(target,ft);
23     }
24     fclose(fp);
25     fclose(ft);
26     printf("\nTask completed!\n");
27     return 0;
28 }
29 void replace(char *s, char *s1)
30 {
31     int i=0,j=0,k=0;
32     char temp[100],temp2[100],main[100],*t=temp,*m=main;
33     while(*s!='\0')
34     {
35         *t=s;
36         t++;
37         s++;
38     }
39     *t='\0';
40     while(temp[i]!='\0')
41     {
42         temp2[j]=temp[i];
43         if(temp[i]==' ')
44         {
45             temp2[j]='\0';
46             if(strcmpi(temp2,"the")==0)
47             {
48                 strcpy(temp2," ");
49             }
50             else if(strcmpi(temp2,"an")==0)
51             {
52                 strcpy(temp2," ");
53             }
54         }
55     }
56 }
```

```

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      else if(strcmpi(temp2,"a")==0)
      {
          strcpy(temp2," ");
      }
      j=0;
      while(temp2[j]!='\0')
      {
          main[k]=temp2[j];
          k++;
          j++;
      }
      main[k]=' ';
      k++;
      j=-1;
  }
  i++;
  j++;
}
temp2[j]='\0';
if(strcmpi(temp2,"the")==0)
{
    strcpy(temp2," ");
}
else if(strcmpi(temp2,"an")==0)
{
    strcpy(temp2," ");
}
else if(strcmpi(temp2,"a")==0)
{
    strcpy(temp2," ");
}
else
{
    j=0;
    while(temp2[j]!='\0')
    {
        main[k]=temp2[j];
        k++;
        j++;
    }
    main[k]='\0';
}
while(*m!='\0')
{
    *s1=*m;
    s1++;
    m++;
}
*s1='\0';

```

FILE.txt

1 The quick brown fox jumps over a lazy dog

Output:

```

Name: Parijat Kumar
Roll No.: 20001016037
*****

```

Task completed!

NEW.txt

1 quick brown fox jumps over lazy dog