ASSIGNMENT NO:3 **DATE:06/02/2015**

PROGRAM STATEMENT:For given set of values

x|	**0**	**1**	**3**	**3**
f(x)|	**5**	**6**	**50**	**105**

Compute the value of f(2) using Langrange's Interpolation Formula

THEORY: Let y=f(x) be a function defined in the interval [a,b] and is only known on a set of (n+1) distinct arguments,$x_0,x_1,x_2,,...,x_{r-1},x_r,x_{r+1},...x_{n-1},x_n$,in general,are not equally spaced,in the interval of definition of f(x).Lagrange's interpolation formula can be used to find a polynomial L(x) of degree not greater than n ,such that L(x) replaces f(x) on the set of interpolation points $x_j(j=0,1,2,...,n)$.

$L(x)=\sum_{r=0}^{n} w(x)/(x-x_r)*w'(x_r)*f(x_r)$ is called Lagrange's interpolation formula.

$w_r(x)=w(x)/(x-x_r)*w'(x_r),(r=0,1,2...,n)$is called the Lagrangian Function.

Where w(x) is a polynomial of degree n+1 &

$w_r'(x_r)=(x_r-x_0)(x_r-x_1).....(x_r-x_n)$

PROGRAM CODE:

```
//C Program to implement Langrange's Interpolation Formula
#include <stdio.h>
int main()
{
      int n,i,j;
      printf("Enter number of arguments::");
      scanf("%d",&n);
      double f[n][n+4],x,d,w=1,s=0;
      printf("Enter values of x\n");
      for(i=0;i<n;i++)
      {
            scanf("%lf",&f[i][0]);
      }
      printf("Enter corresponding values of y\n");
      for(i=0;i<n;i++)
      {
            scanf("%lf",&f[i][n+2]);
      }
      printf("Enter the value of x for which you want to find the
result::");
      scanf("%lf",&x);
      for(i=0;i<n;i++)
      {
            d=1;
            for(j=1;j<n+1;j++)
            {
                  if(j==i+1)
                  {
                        f[i][j]=x-f[j-1][0];
                        w=w*f[i][j];
                  }
                  else
                  {
                        f[i][j]=f[i][0]-f[j-1][0];
```

```
                }
                d=d*f[i][j];
            }
            f[i][j]=d;
            f[i][j+2]=f[i][j+1]/d;
            s=s+f[i][j+2];
        }
        printf("The Computational Table is::\nx");
        for(i=0;i<n-1;i++)
        {
            printf("\t\t");
        }
        printf("Row Product=\t\tD\t\ty\t\ty/D\n");
        for(i=0;i<n;i++)
        {
            for(j=0;j<n+4;j++)
            {
                printf("%.2lf\t",f[i][j]);
            }
            printf("\n");
        }
        s=w*s;
        printf("The value of y by langrange's formula is:%.2lf\n",s);
        return 0;
}
```

OUTPUT:

```
Enter number of arguments::4
Enter values of x
0 1 3 4
Enter corresponding values of y
5 6 50 105
Enter the value of x for which you want to find the result::2
The Computational Table is::
x               Row Product=          D     y          y/D
0.00  2.00  -1.00 -3.00 -4.00      -24.00     5.00       -0.21
1.00  1.00  1.00  -2.00 -3.00      6.00       6.00       1.00
3.00  3.00  2.00  -1.00 -1.00      6.00       50.00      8.33
4.00  4.00  3.00  1.00  -2.00      -24.00     105.00     -4.38
The value of y by langrange's formula is:19.00
```