ASSIGNMENT NO:1 **DATE:30/01/2015**

PROGRAM STATEMENT:For given set of values

x|	**0**	**1**	**2**	**3**
f(x)|	**1**	**2**	**11**	**34**

Compute the value of f(.5) using Newton's Forward Interpolation Formula

THEORY: *Newton's Forward Interpolation Formula is,*

$$f(x)\approx p(x)=f(x_0)+u.\Delta f(x_0)+u.(u-1)\Delta^2 f(x_0)/2!+.....+u(u-1)....(u-n+1).\Delta^n f(x_0)/n!$$

Where x_0 is the starting point of an equispaced(of spaced h) n intervals, p(x) is the assumed a polynomial of degree less than or equal to n,f(x) is the required function,each

$$\Delta^r f(x_0)=\Delta^{r-1}f(x_0+h)-\Delta^{r-1}f(x_0)\ .$$

PROGRAM CODE:

```
//C Program to Implement Newton's Forward Method
#include <stdio.h>
int main()
{
	int n,i,j,m;
	double x,h,u,p,s;
	printf("Enter number of arguments:");
	scanf("%d",&n);
	m=n+1;
	double f[n][n+1];
	printf("Enter values of x\n");
	for(i=0;i<n;i++)
	{
		scanf("%lf",&f[i][0]);
		if(i==1)
		{
			h=f[1][0]-f[0][0];
		}
		if((i>1)&&(f[i][0]-f[i-1][0]!=h))
		{
			printf("%lf %lf Non-equispaced intervals. Program
Terminated\n",h,f[i][0]-f[i-1][0]);
			return 1;
		}
	}
	printf("Enter corresponding values of y i.e f(x)\n");
	for(i=0;i<n;i++)
	{
		scanf("%lf",&f[i][1]);
	}
	for(i=1;i<n;i++)
	{
		for(j=0;j<m-1;j++)
		{
			f[j][i+1]=f[j+1][i]-f[j][i];
		}
		m--;
	}
	m=n+1;
```

```
      printf("The Forward Difference Table is:\nx\tf(x)\tΔf(x)");
      for(i=2;i<n;i++)
      {
            printf("\tΔ^%df(x)",i);
      }
      printf("\n--------------------");
      for(i=2;i<=n;i++)
      {
            printf("-------");
      }
      for(i=0;i<n;i++)
      {
            printf("\n");
            for(j=0;j<m;j++)
            {
                  printf("%.3lf\t",f[i][j]);
            }
            m--;
      }
      printf("\nEnter x for which you want to find the value of f(x):");
      scanf("%lf",&x);
      if(x>(f[0][0]+f[n-1][0])/2)
      {
            printf("Value of x is near the end of the table. Use Newton's
Backward formula. Program Terminated\n");
            return 2;
      }
      u=(x-f[0][0])/h;
      s=f[0][1];
      p=u;
      m=n+1;
      for(i=2;i<m;i++)
      {
            s=s+(p*f[0][i]);
            p=p*(u-i+1)/i;
      }
      printf("The value of f(x) for given x is %.3lf\n",s);
      return 0;
}
```

OUTPUT:

```
Enter number of arguments:4
Enter values of x
0 1 2 3
Enter corresponding values of y i.e f(x)
1 2 11 34
The Forward Difference Table is:
x     f(x)       Δf(x)      Δ^2f(x)    Δ^3f(x)
----------------------------------------
0.000 1.000      1.000      8.000      6.000
1.000 2.000      9.000      14.000
2.000 11.000     23.000
3.000 34.000
Enter x for which you want to find the value of f(x):.5
The value of f(x) for given x is 0.875
```