

EXAMINER'S MIND

1. (a) How real numbers and integers are stored in memory ? Explain with examples.
(b) Explain with the help of suitable example the operation multiplication on two numbers represented in normalized floating point notation.
(c) Explain the various types of errors, which are encountered, while performing numerical calculations. Explain with examples. (Pbi. U. B.C.A. April 2005)
2. (a) What are Binary numbers ? Explain their uses in Computer Science.
(b) How are floating point numbers represented in memory ? Explain with examples.
(c) Explain the arithmetic operation with normalized floating point numbers with suitable examples. (Pbi. U. B.C.A. Sept. 2005)
3. (a) An approximate value of π is given by $X_1 = \frac{22}{7} = 3.1428571$ and its true value is $X = 3.1415926$. Find the absolute error and relative error.
(b) Explain rounding off and chopping processes with reference to their use in computers with suitable examples.
(c) Explain how floating point numbers are stored in computer memory with suitable examples. (Pbi. U. B.C.A. April 2006)
4. (a) Explain the various types of errors, which are encountered, while performing numerical calculations. Explain with examples.
(b) Explain the operation multiplication on two numbers represented in normalized floating point notation with the help of suitable examples. (Pbi. U. B.C.A. Sept. 2006)
5. (a) Find the root of the equation $x e^x = \cos x$ using the Regular-Falsi method correct to three decimal places.
(b) Find by the Newton-Raphson method, the real root of $3x - \cos x - 1 = 0$.
(Pbi. U. B.C.A. April 2005; Sept. 2006)
6. Obtain a root of the following equation : $x^3 - x^2 - 1 = 0$
correct to three decimal places using :
(a) Bisection method.
(b) Method of false position. (Pbi. U. B.C.A. Sept. 2005)
7. (a) Find the real root of the equation $x^3 - x - 4 = 0$ by Regular-Falsi method.
(b) Evaluate $\sqrt{12}$ to four decimal places by Newton Raphson method.
8. Find a real root of the equation
 $x^3 - 2x - 5 = 0$, correct upto two decimal places by the Regula-False method.
(Pbi. U. B.C.A. April 2006)
(Pbi. U. B.C.A. Sept. 2006)

9. Solve the following set of equations by Gauss Elimination method :

$$x_1 + x_2 + x_3 = 3$$

$$2x_1 + 3x_2 + x_3 = 6$$

$$x_1 - x_2 - x_3 = 3$$

(Pbi. U. B.C.A. April 2005; Sept. 2006)

10. Explain the Gauss elimination method to solve the system of equations. Solve the following system :

$$5x - 2y + z = 4$$

$$7x + y - 5z = 8$$

$$3x + 7y + 4z = 10$$

(Pbi. U. B.C.A. Sept. 2005)

11. Solve :

$$10x_1 - 2x_2 - x_3 - x_4 = 3$$

$$-2x_1 + 10x_2 - x_3 - x_4 = 15$$

$$-x_1 - x_2 + 10x_3 - 2x_4 = 27$$

$$-x_1 - x_2 - 2x_3 + 10x_4 = -9$$

by Gauss-Seidal iterative method.

(Pbi. U. B.C.A. April 2005, 2006; Sept. 2006)

12. Solve the following system of equations using Gauss-Siedel interative method :

$$20x_1 + 2x_2 + 6x_3 = 28$$

$$x_1 + 20x_2 + 2x_3 = -23$$

$$2x_1 - 7x_2 - 20x_3 = 57$$

(Pbi. U. B.C.A. Sept. 2005)

13. Solve the following equations by Gauss elimination method :

$$x - y + 3z + 4t = 9/2$$

$$3x - y + 2z + 5t = 19/2$$

$$2x + 4y - 5z + t = 15$$

$$4x + 2y - z + 3t = 12$$

(Pbi. U. B.C.A. April 2006)

14. (a) What do you mean by Interpolation ? The specific heat of water as a function of temperature is :

Temp. in degrees (centigrade)		Specific heat
20	-	0.99907
25	-	0.99852
30	-	0.99826
35	-	0.99818
40	-	0.99828
45	-	0.99849
50	-	0.99878

Interpolate the specific heat at 37°C using Langrange's interpolation.

- (b) Explain spline interpolation with examples.

(Pbi. U. B.C.A. April 2005)

15. (a) State Lagrange's Interpolation formula. Find the missing term in the following table :

$x :$	0	1	2	3	4
$y :$	1	3	9	?	81

- (b) Explain Spline interpolation with an example.

(Pbi. U. B.C.A. Sept. 2005)

16. (a) Given

$x :$	0	5	10	15	20	25
$y :$	7	11	14	18	24	32

Find y when $x = 8$ and 24 .

- (b) From the data given in the following table, find by Langrange's formula, the value of y when $x = 102$;

$x :$	93.0	96.2	100.0	104.2	108.7
$y :$	11.38	12.80	14.70	17.07	19.91

(Pbi. U. B.C.A. April 2006)

17. (a) What do you mean by Interpolation ? The population of a town in census was as under :

Years :	1891	1901	1911	1921	1931
Population :	46	66	81	93	101

(in thousands)

Estimate the population for the years :

- (i) 1895 (ii) 1925

- (b) Explain the Spline interpolation with examples.

(Pbi. U. B.C.A. Sept. 2006)

18. Write short notes on the following :

- (a) Taylor series representation (b) Chebyshev series

- (c) Approximation of functions

(Pbi. U. B.C.A. April 2005)

19. Write short notes on the following :

- (a) Exponential and Trigonometric approximation. (b) Taylor series

- (c) Chebyshev series

(Pbi. U. B.C.A. Sept. 2005)

20. (a) Given $\frac{dy}{dx} = 1 + x y$, $y(1) = 1$

Obtain Taylor's series for $y(x)$ and compute $y(0, 1)$ correct to three decimal places.

- (b) Write short note on exponential and trigonometric approximation with the help of suitable examples.

(Pbi. U. B.C.A. April 2006)

21. Write short notes on the following with suitable examples :

(a) Taylor Series

(b) Cyebyshev Series

(c) Linear regression and Polynomial regression.

(Pbi. U. B.C.A. Sept. 2006)

22. (a) Give the following distribution :

Class interval	Frequency
$0 \leq x < 4$	5
$4 \leq x < 8$	3
$8 \leq x < 12$	8
$12 \leq x < 16$	5

Computer the following measures of central tendency and dispersion :

(i) Median (ii) Mean (iii) Kurtosis (iv) Variance

(b) What do you understand by dispersion ? Explain the relative merits and demerits of various measures of dispersion ?

(Pbi. U. B.C.A. April 2005)

23. (a) Discuss the uses and limitations of Statistics.

(b) Calculate the mean, mode and median of the following data :

Size :	4	6	8	10	12	14	16
Frequency :	2	1	3	6	4	3	1

(Pbi. U. B.C.A. Sept. 2005)

24. (a) Write a note on different measures of dispersion.

(b) Calculate the mean and S.P. of the following distribution :

Age in year : 20 – 25 25 – 30 30 – 35 35 – 40 40 – 45 45 – 50

No. of persons : 170 110 80 45 40 35

(Pbi. U. B.C.A. April 2006)

25. (a) What do you understand by Dispersion ? Explain the relative merits and demerits of various measures of dispersions ?

(b) Calculate the mean, median and mode for the following frequency distribution :

Marks :	0 – 20	20 – 40	40 – 60	60 – 80	80 – 100
Frequency :	3	17	27	20	9

(Pbi. U. B.C.A. Sept. 2006)

26. (a) Find Karl Pearson's coefficient of correlation between age and playing habits of the following students :

Age :	15	16	17	18	19	20
No. of students :	250	200	150	120	100	80
Regular Players :	200	150	90	48	30	16

- (b) The result of measurement of electric resistance R of a copper bar at various temperature $t^{\circ}\text{C}$ are given as :

t :	19	25	30	36	40	45	50
R :	76	77	79	80	82	83	85

Find a relation $R = a + bt$, where a and b are constants to be determined, using method of least squares.
(Pbi. U. B.C.A. April 2005)

27. Calculate the Karl Pearson's Coefficient of Correlation and Regression equations from the following data :

A :	15	25	14	20	10	20
B :	10	30	16	25	20	15

(Pbi. U. B.C.A. Sept. 2005)

28. (a) Two regression lines of a sample are $x + 6y = 6$ and $3x + 2y = 10$. Find :

(i) \bar{x}, \bar{y} (ii) Correlation coefficient

- (b) Calculate the rank correlation from the following data :

x :	12	9	8	10	11	13	7
y :	14	8	6	9	11	12	3

(Pbi. U. B.C.A. April 2006)

29. Calculate the Karl Pearson's coefficient of correlation for the data given below taking 66 and 63 as assumed means of X and Y respectively :

Height of Husbands : 60 62 64 66 68 70 72 (in inches)

Height of Wives : 61 63 63 63 64 65 67 (in inches)

(Pbi. U. B.C.A. Sept. 2006)

SHORT ANSWER TYPE QUESTIONS

30. Attempt all the parts :

(a) Evaluate $\sqrt{12}$ to four decimal places by Newton-Raphson method.

(b) Define Skewness and Kurtosis.

(c) Write binary equivalent of the following :

(i) $(36)_{10}$ (ii) $(791)_{10}$

- (d) Write short note on bi-section method.
- (e) Write comparison of direct and iterative methods.
- (f) Explain Rank-correlation with an example.
- (g) Define normalized floating point representation. Using this add .6434E99 and .4845E99.
- (h) Differentiate between Primary and Secondary data.
- (i) If two regression coefficients are 0.8 and 1.2, what would be the value of coefficients of correlation ?
- (j) Explain rounding errors and truncation errors with examples.

(Pbi. U. B.C.A. April 2005)

31. Attempt all the parts :

- (a) Evaluate $\sqrt{12}$ to four decimal places by Newton-Raphson method.
- (b) Explain with one example : Ill-conditioned equations.
- (c) Given $y_0 = -12, y_1 = 0, y_3 = 6, y_4 = 12$

Find y_2 .

- (d) Define Skewness and Kurtosis.
- (e) Explain Rank-correlation with an example.
- (f) Define a Polynomial equation.
- (g) Explain the various measures of Dispersion.
- (h) Explain the terms-Absolute errors and Relative errors.
- (i) What is Regression ? Why are there two regression lines ? Under what conditions can there be one regression line ?
- (j) Explain the implication of positive and negative correlation.

(Pbi. U. B.C.A. Sept. 2005)

32. Attempt all the parts :

- (a) Explain the uses & limitations of Statistics.
- (b) Explain the formula for Mode & Median.
- (c) Explain the difference tables with examples.
- (d) Write Binary equivalent of the following :
 - (i) (36)
 - (ii) (791)

- (e) Explain Bi-section method.
- (f) Explain ill-condition equations with an example.
- (g) Explain spline interpolation.
- (h) Explain Chebyshev series.
- (i) Explain Skewness and Kurtosis.
- (j) Explain least square method in brief.

(Pbi. U. B.C.A. April 2006)

33. Attempt all the parts :

- (a) What is the relationship among Mean, Median and Mode ?
- (b) Define normalized floating point representation. Using this add .6434E99 and .4845E99 ?
- (c) Define Skewness and Kurtosis ?
- (d) Explain rounding errors and truncation errors with examples.
- (e) Explain the difference between direct and iterative method.
- (f) Write binary equivalent of the following :
 - (i) $(36)_{10}$
 - (ii) $(791)_{10}$
- (g) Write short note on bi-section method.
- (h) Explain Exponential and Trigonometric approximation.
- (i) Explain Rank-Correlation with an example.
- (j) Explain with one example – ill conditioned equations.

(Pbi. U. B.C.A. Sept. 2006)

SOFTWARE LAB – VI

BCA-226:

(Based on paper BCA-224 : Computer Oriented Numerical and Statistical Methods)

Max Marks: 50

Maximum Time: 3 Hrs.

Min Pass Marks: 35%

Practical Sessions to be conducted: 40-50 Hrs

This laboratory course will comprise as exercises to supplement what is learnt under paper BCA-224: Computer Oriented Numerical and Statistical Methods. Students are required to develop the following programs in C/C++ language with internal documentation:

1. Write a program to compute the mean of raw data.
2. Write a program to compute the mean of discrete series (x, f).
3. Write a program to compute the mean and weighted mean of continuous series.
4. Write a program to compute the mode and median of raw data.
5. Write a program to compute the median of discrete series (x, f).
6. Write a program to compute the median of continuous series.
7. Write a program to compute the mode of discrete series (x, f).
8. Write a program to compute the mode of continuous series.
9. Write a program to compute the standard deviation and variance of discrete series.
10. Write a program to compute the standard deviation and variance of continuous series.
11. Write a program to compute the correlation using Karl Pearson's Correlation
12. Write a program to compute the regression coefficients.
13. Write a program for Bisection method.
14. Write a program for Regula-falsi method.
15. Write a program for Secant method.
16. Write a program for Newton-Raphson method.
17. Write a program for Gauss-Elimination method.
18. Write a program for Lagrange's Interpolation method.
19. Write a program for Newton-Interpolation method.

Program No. 1

//Write a program in C++ to compute the mean of raw data.

```
#include<iostream.h>
#include<conio.h>
void main()
{
    int i,n;
    float x[50],sum=0,mean;
    /* x is an array containing n values, sum is their total
    and mean is arithmetic mean of the values */
    cout<<"Enter the number values\n";
    cin>>n;
    cout<<"Enter "<<n<<" values\n";
    for(i=0;i<n;i++)
    {
        cin>>x[i];
        sum=sum+ x[i];
    }
    mean= sum/n;           //Mean of Individual Series
    cout<<"Arithmetic Mean of individual series="<<mean;
    getch();
}
```

Program No. 2

//Write a Program to find Arithmetic mean of discrete series

```
#include<iostream.h>
#include<conio.h>
void main()
{
    int i,n,f[50],tf=0;
    float x[50],fx=0,mean;
    /* x and f are two arrays containing values and their
    frequencies, tf is total of frequency, fx is sum of x*f
    and mean is their arithmetic mean */
    cout<<"Enter the number of values\n";
    cin>>n;
    cout<<"Enter "<<n<<" values of x and f\n";
    for(i=0;i<n;i++)
    {
        cin>>x[i]>>f[i];
        fx=fx+x[i]*f[i];
        tf=tf+f[i];
    }
    mean=fx/tf;
    cout<<"Arithmetic Mean of discrete series="<<mean;
    getch();
}
```

Program No. 3

//Write a program to compute the mean of continuous series.

```
#include<iostream.h>
#include<conio.h>
#include<math.h>
void main()
{
    int i,n,f[50],tf=0;
    float ll[50],ul[50],mid[50],sum=0,mean;
    /* ll,ul and f are three arrays containing lower limit, upper limit and frequencies, mid is mid point, tf is total of frequency, sum is sum of mid*f and mean is their arithmetic mean */
    clrscr();
    cout<<"enter the number of values\n";
    cin>>n;
    cout<<"Enter "<<n<<"values of lower limit,upper limit and f\n";
    for(i=0;i<n;i++)
    {
        cin>>ll[i]>>ul[i]>>f[i];
        mid[i]=(ll[i]+ul[i])/2;
        sum=sum+f[i]*mid[i];
        tf=tf+f[i];
    }
    mean=sum/tf;
    cout<<"Arithmetic Mean of continuous series="<<mean;
    getch();
}
```

Program No. 4

//Write a Program to find Weighted Arithmetic mean

```
#include<iostream.h>
#include<conio.h>
void main()
{
    int i,n,W[50],tW=0;
    float X[50],WX=0,mean;
    /* X and W are two arrays containing values and their Weights, tW is total of weights, WX is sum of W*X and mean is their arithmetic mean */
    cout<<"Enter the number of values\n";
    cin>>n;
    cout<<"Enter "<<n<<" values of X and W\n";
    for(i=0;i<n;i++)
    {
        cin>>X[i]>>W[i];
        WX=WX+X[i]*W[i];
        tW=tW+W[i];
    }
}
```

```

    }
    mean=WX/tW;
    cout<<"Weighted Arithmetic Mean ="<<mean;
    getch();
}

```

Program No. 5

```

/*Program to find median of individual series */
#include<iostream.h>
#include<conio.h>
void main()
{
int i,j,n;
float x[50],median,temp;
/* x is an array containing n values, sum is their total and median is median of the values */
clrscr();
cout<<"Enter the number of Values\n";
cin>>n;
cout<<"Enter "<<n<<" Values\n";
for(i=0;i<n;i++)
    cin>>x[i];
/*First Data Values are sorted in Ascending Order */
for(i=0;i<n-1;i++)
    for(j=0;j<=n-i-1;j++)
        if(x[j]>x[j+1])
        {
            temp=x[j];
            x[j]=x[j+1];
            x[j+1]=temp;
        }
cout<<"Data in ascending order\n";
for(i=0;i<n;i++)
    cout<<"\t"<<x[i];
if(n%2==0)                                // No. of values are Even
    median=(x[n/2-1]+x[(n/2-1)+1])/2;
else
    median=x[(n+1)/2-1];                  // No. of values are Odd
cout<<"\nMedian of Individual Series="<<median;
getch();
}

```

Program No. 6

//Write a Program to find median of discrete series

```

#include<iostream.h>
#include<conio.h>
void main()
{
int i,n,f[50],N=0,cumf[50];

```

```

float x[50],median,temp;
/* x and f are two arrays containing values and their frequencies, N is total of frequency,cumf is cumulative
frequency,median is their median, temp is a variable that contain N+1/2 */
clrscr();
cout<<"Enter the number of Values\n";
cin>>n;
cout<<"Enter <<n<< values of x and f with x in ascending order\n";
for(i=0;i<n;i++)
{
    cin>>x[i]>>f[i];
    N=N+f[i];
}
temp=(N+1)/2;
cumf[0]=f[0];
for(i=1;i<n;i++)
    cumf[i]=cumf[i-1]+f[i];
cout<<"\n x           f           cumf";
for(i=0;i<n;i++)
{
    cout<<"\n"<<x[i]<<"\t"<<f[i]<<"\t"<<cumf[i];
}
cout<<"\n(N+1)/2="<<temp;
i=0;
while(cumf[i]<=temp)
    i++;
cout<<"\nMedian of Discrete Series="<<x[i];
getch();
}

```

Program No. 7

```

//Write a Program to find median of continuous series
#include<iostream.h>
#include<conio.h>
void main()
{
int i,n,f[50],N=0,cumf[50];
float ll[50],ul[50],median,h,temp;
/* ll,ul and f are three arrays containing lower limit, upper limit and frequencies,mid is mid point, tf is total of
frequency,cumf is cumulative frequency,median is their median, temp is a variable that contain N/2 */
clrscr();
cout<<"enter the number of values\n";
cin>>n;
cout<<"Enter <<n<< values of lower limit,upper limit and f\n";
for(i=0;i<n;i++)
{
    cin>>ll[i]>>ul[i]>>f[i];
    N=N+f[i];
}

```

```

}
temp=(float)N/2;
cumf[0]=f[0];
for(i=1;i<n;i++)
    cumf[i]=cumf[i-1]+f[i];
cout<<"\n lower limit \t upper limit \t frequency \t cumf";
for(i=0;i<=n;i++)
{
    cout<<"\n" <<ll[i] << "\t" <<ul[i] << "\t" << f[i] << "\t" << cumf[i];
}
cout<<"\nN/2=" << temp;
i=1;
while(cumf[i]<=temp)
    i++;
h=ul[i]-ll[i];
median=ll[i]+((temp-cumf[i-1])*h)/f[i];
cout<<"\nMedian of Continuous Series=" << median;
getch();
}

```

Note: For Mode use Empirical Relation Mode= 3*Median-2*Mean

Program No. 8

```

/*Write a program to compute the standard deviation, variance and coefficient of variation of Individual series.*/
#include<iostream.h>
#include<conio.h>
#include<math.h>
void main()
{
int i,n;
float x[50],sum=0,mean,sumsq=0,sd,var,cv;
/* x is an array containing n values, sum is their total,sumsq is sum of squares of deviations from mean, mean is their arithmetic mean, sd is their standard deviation, cv is coefficient of variation */
clrscr();
cout<<"Enter the number of values\n";
cin>>n;
cout<<"Enter "<<n<<" values\n";
for(i=0;i<n;i++)
{
    cin>>x[i];
    sum=sum+x[i];
}
mean=sum/n;
cout<<"\nArithmetic Mean=" << mean;
for(i=0;i<n;i++)
    sumsq=sumsq+pow((x[i]-mean),2);
sd=sqrt(sumsq/n);

```

```

var=pow(sd,2);
cv=(sd/mean)*100;
cout<<"\nStandard Deviation=" <<sd;
cout<<"\nVariance" <<var;
cout<<"\nCoefficient of Variation" <<cv;
getch();
}

```

Program No. 9

*/*Write a program to compute the standard deviation and variance of discrete series.*/*

```

#include<iostream.h>
#include<conio.h>
#include<math.h>
void main()
{
int i,n,f[50],tf=0;
float x[50],sum=0,mean,sumsq=0,sd,cv;
/* x,f are two arrays containing n values and their frequencies, sum is total of x*f,tf is total frequency, sumsq is sum of
squares of deviations from mean*frequency, mean is their arithmetic mean, sd is their standard deviation, cv is
coefficient of variation */
clrscr();
cout<<"Enter the number of values\n";
cin>>n;
cout<<"Enter "<<n<<" values of x and f\n";
for(i=0;i<n;i++)
{
    cin>>x[i]>>f[i];
    sum=sum+x[i]*f[i];
    tf=tf+f[i];
}
mean=sum/tf;
cout<<"Arithmetic Mean=" <<mean;
for(i=0;i<n;i++)
    sumsq=sumsq+f[i]*pow((x[i]-mean),2);
sd=sqrt(sumsq/tf);
cv=(sd/mean)*100;
cout<<"\nStandard Deviation=" <<sd;
cout<<"\nVariance" <<sumsq/tf;
cout<<"\nCoefficient of Variation" <<cv;
getch();
}

```

Program No. 10

*/*Write a program to compute standard deviation and variance of continuous series. */*

```

#include<iostream.h>
#include<conio.h>
#include<math.h>
void main()

```

```

{
int i,n,f[50],tf=0;
float ll[50],ul[50],mid[50],sum=0,mean,sumsq=0,sd,cv;
/* ll,ul and f are three arrays containing lower limit, upper limit and frequencies,mid is mid point, sum is total of x*f,tf is total frequency,sumsq is sum of squares of deviations from mean*frequency, mean is their arithmetic mean, sd is their standard deviation, cv is coefficient of variation */
clrscr();
cout<<"Enter the number of values\n";
cin>>n;
cout<<"Enter "<<n<<" values of lower limit,upper limit and f\n";
for(i=0;i<n;i++)
{
    cin>>ll[i]>>ul[i]>>f[i];
    mid[i]=(ll[i]+ul[i])/2;
    sum=sum+f[i]*mid[i];
    tf=tf+f[i];
}
mean=sum/tf;
cout<<"\nArithmetic Mean of continuous series="<<mean;
for(i=0;i<n;i++)
    sumsq=sumsq+f[i]*pow((mid[i]-mean),2);
sd=sqrt(sumsq/tf);
cv=(sd/mean)*100;
cout<<"\nStandard Deviation="<<sd;
cout<<"\nVariance"<<sumsq/tf;
cout<<"\nCoefficient of Variation"<<cv;
getch();
}

```

Program No. 11

```

/* Write a program to compute Karl Pearson's Correlation coefficient.*/
#include<iostream.h>
#include<conio.h>
#include<math.h>
void main()
{
int i,n;
float x[50],y[50],sxy=0,sx=0,sy=0,sx2=0,sy2=0,den.,num,r;
clrscr();
cout<<"Enter the number of Pairs\n";
cin>>n;
cout<<"Enter "<<n<<" values of x and y\n";
for(i=0;i<n;i++)
{
    cin>>x[i]>>y[i];
    sxy=sxy+x[i]*y[i];
    sx=sx+x[i];
    sy=sy+y[i];
}

```

```

sx2=sx2+x[i]*x[i];
sy2=sy2+y[i]*y[i];

}
den=sqrt((n*sx2-sx*sx)*(n*sy2-sy*sy));
num= n*sxy-sx*sy;
r=num/den;
cout<<"Karl Pearson's Correlation coefficient=" <<r;
getch();
}

```

Program No. 12

/ Write a program to compute the regression coefficients.*/*

```

#include<iostream.h>
#include<conio.h>
#include<math.h>
void main()
{
int i,n;
float x[50],y[50],sxy=0,sx=0,sy=0,sx2=0,sy2=0,den1,den2,bxy,byx;
clrscr();
cout<<"Enter the number of pairs\n";
cin>>n;
cout<<"Enter "<<n<<" pairs\n";
for(i=0;i<n;i++)
{
    cin>>x[i]>>y[i];
for(i=0;i<n;i++)
{
    sx=sx+x[i];
    sy=sy+y[i];
    sx2=sx2+x[i]*x[i];
    sxy=sxy+x[i]*y[i];
    sy2=sy2+y[i]*y[i];
}
num=n*sxy-sx*sy;
den1=n*sx2-sx*sx;
den2=n*sy2-sy*sy;
byx=num/den1;
bxy= num/den2;
r=sqrt(bxy*byx);
cout<<"\n Regression coefficient of y on x is y=" <<byx;
cout<<"\n Regression coefficient of x on y is x=" <<bxy;
cout<<"\n Correlation coefficient=" <<r;
getch();
}

```

Program No. 13**//Write a Program for Bisection Method**

```
#include<stdio.h>
#include<math.h>
#include<conio.h>
#define EPS 0.001
#define F(x) (x)*(x)*(x)-(x)-1
void main()
{
    int i = 1;
    float x0,x1,x2;
    double f1,f2,f0,t;
    clrscr();
    printf("\nEnter the value of x0: ");
    scanf("%f",&x0);
    printf("\nEnter the value of x1: ");
    scanf("%f",&x1);
    printf("\n");
    printf("\niteration\t x0\t x1\t x2\t f0\t f1\t f2");
    printf("\n");
    do
    {
        x2=(x0+x1)/2;
        f0=F(x0);
        f1=F(x1);
        f2=F(x2);
        printf("\n%d %f %f %f %lf %lf %lf", i, x0,x1,x2,f0,f1,f2);
        if(f0*f2<0)
            x1=x2;
        else
            x0=x2;
        i++;
    }while(fabs(f2)>EPS);
    printf("\n");
    printf("\nApp.root = %f",x2);
    getch();
}
```

Program No. 14**//Write a Program for Regula-Falsi Method**

```
#include<stdio.h>
#include<conio.h>
#include<math.h>
float f(float x)
{
    return (x*x*x-8*x+1);
}
```

```

void main()
{
    int iteration=0, maxiteration;
    float x1,x2,x3,x4,apperr;
    printf("\nProgram to find Root of an Equation by Regula falsi Method\n\n");
    printf("\nEnter value of x0, x1, allowed error and maximum iteration\n");
    scanf("%f %f %f %d", &x1, &x2, &apperr, &maxiteration);
    x3=((x1*f(x2))-(x2*f(x1)))/(f(x2)-f(x1));
    printf("\n\nIn iteration %d, Value of x3 =\t%f",iteration+1,x3);
    do
    {
        if(f(x1)*f(x3)<0)
            x2=x3;
        else
            x1=x3;
        x4=x3;
        x3=((x1*f(x2))-(x2*f(x1)))/(f(x2)-f(x1));
        iteration++;
        printf("\n\nIn iteration %d Value of x=\t%f", iteration+1,x3);
        if(fabs(x4-x3)<apperr)
        {
            printf("\n\nAfter %d iteration, Root= %f", iteration,x4);
            getch();
        }
    }while (iteration<maxiteration);
    printf("\n\nSolution does not converge Iteration not sufficient");
    getch();
}

```

Program No. 15

//Write a Program for Secant Method

```
#include<stdio.h>
#include<conio.h>
#include<math.h>
#define EPS 0.0001
#define F(x) (x)*(x)*(x) - (x)- 1
void main()
{
    float x1,x2,x3,f1,f2,t;
    clrscr();
    printf("\nEnter the value of x1: ");
    scanf("%f",&x1);
    printf("\nEnter the value of x2: ");
    scanf("%f",&x2);
    printf("\n");
    printf("\n x1\t x2\t x3\t f(x1)\t f(x2)");
    printf("\n");
}
```

```

do
{
f1=F(x1);
f2=F(x2);
x3=x2-((f2*(x2-x1))/(f2-f1));
printf("\n%f %f %f %f",x1,x2,x3,f1,f2);
x1=x2;
x2=x3;
if(f2<0)
t=abs(f2);
else
t=f2;
}while(t>EPS);
printf("\n_____________________________________\n");
printf("\n\nApp.root = %f",x3);
getch();
}

```

Program No. 16**//Write a Program for Newton Raphson Method**

```

#include<conio.h>
#include<stdio.h>
#include<stdlib.h>
#include<math.h>
int max_power,i=0,cnt=0,flag=0;
int coef[10]={0};
float x1=0,x2=0,t=0;
float fx1=0,fdx1=0;
void main()
{
clrscr();
printf("\n\n\n\t\t PROGRAM FOR NEWTON RAPHSON GENERAL");
printf("\n\n\n\tENTER THE TOTAL NO. OF POWER::: ");
scanf("%d",&max_power);
for(i=0;i<=max_power;i++)
{
    printf("\n\t x^%d:::",i);
    scanf("%d",&coef[i]);
}
printf("\n");
printf("\n\t THE POLYNOMIAL IS ::: ");
for(i=max_power;i>=0;i--)//printing coeff.
    printf(" %dx^%d",coef[i],i);
printf("\n\tINITIAL X1---->");
scanf("%f",&x1);
printf("\n*****");
printf("\n ITERATION X1 FX1 F'X1 ");

```

```

printf("\n*****");
do
{
    cnt++;
    fx1=fdx1=0;
    for(i=max_power;i>=1;i--)
    {
        fx1+=coef[i] * (pow(x1,i));
    }
    fx1+=coef[0];
    for(i=max_power;i>=0;i--)
    {
        fdx1+=coef[i]* (i*pow(x1,(i-1)));
    }
    t=x2;
    x2=(x1-(fx1/fdx1));
    x1=x2;
    printf("\n %d      %6.3f %6.3f %6.3f",cnt,x2,fx1,fdx1);
}while((fabs(t - x1))>=0.0001);
printf("\n\n THE ROOT OF EQUATION IS %f",x2);
getch();
}

```

Program No. 17

//Write a program for Gauss-Elimination method.

```

#include<iostream.h>
#include<conio.h>
void main()
{
    int i, j, k, n;
    float A[20][20], c, x[10], sum=0.0;
    cout<<"\nEnter the order of matrix: ";
    cin>>n;
    cout<<"\nEnter the elements of augmented matrix row-wise:\n\n";
    for(i=0; i<n; i++)
    {
        for(j=0; j<n+1; j++)
            cin>>A[i][j];
    }
    for(j=0; j<n; j++) /* loop for the generation of upper triangular matrix*/
    {
        for(i=0; i<n; i++)
        {
            if(i>j)
            {
                c=A[i][j]/A[j][j];
                for(k=0; k<n+1; k++)

```

```

        A[i][k]=A[i][k]-c*A[j][k];
    }
}
x[n-1]=A[n-1][n]/A[n-1][n-1];
/* this loop is for backward substitution*/
for(i=n-2; i>=0; i--)
{
    sum=0;
    for(j=i+1; j<n; j++)
        sum=sum+A[i][j]*x[j];
    x[i]=(A[i][n+1]-sum)/A[i][i];
}
cout<<"\nThe solution is: \n";
for(i=0; i<n; i++)
{
    cout<<x[i]<<endl; /* x1, x2, x3 are the required solutions*/
}
}

```

Program No. 18

//Write a program for Lagrange-Interpolation method

```

#include<stdio.h>
#include<conio.h>
#include<math.h>
void main()
{
    float x[10],y[10],temp=1,f[10],sum,p;
    int i,n,j,k=0,c;
    clrscr();
    printf("\n\nhow many record you will be enter: ");
    scanf("%d",&n);
    for(i=0; i<n; i++)
    {
        printf("\n\nenter the value of x%d: ",i);
        scanf("%f",&x[i]);
        printf("\n\nenter the value of f(x%d): ",i);
        scanf("%f",&y[i]);
    }
    printf("\n\nEnter X for finding f(x): ");
    scanf("%f",&p);
    for(i=0;i<n;i++)
    {
        temp = 1;
        k = i;
        for(j=0;j<n;j++)
        {

```

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```
if(k==j)
{
    continue;
}
else
{
    temp = temp * ((p-x[j])/(x[k]-x[j]));
}
f[i]=y[i]*temp;
}
for(i=0;i<n;i++)
{
    sum = sum + f[i];
}
printf("\n\n f(%f) = %f ",p,sum);
getch();
}
```

Program No. 19

//Write a program for Newton-Interpolation method (Divided-Difference Formula)

```
#include<stdio.h>
#include<conio.h>
#include<math.h>
void main()
{
float x[10],y[10][10],sum,p,u,temp;
int i,n,j,k=0,f,m;
float fact(int);
clrscr();
printf("\n how many record you will be enter: ");
scanf("%d",&n);
for(i=0; i<n; i++)
{
    printf("\n\n enter the value of x%d: ",i);
    scanf("%f",&x[i]);
    printf("\n\n enter the value of f(x%d): ",i);
    scanf("%f",&y[k][i]);
}
printf("\n\n Enter X for finding f(x): ");
scanf("%f",&p);
for(i=1;i<n;i++)
{
    k=i;
    for(j=0;j<n-i;j++)
    {
        y[i][j]=(y[i-1][j+1]-y[i-1][j])/((x[k]-x[j]));
    }
}
sum=y[1][0];
for(i=2;i<n;i++)
{
    u=(p-x[i])/x[i];
    sum+=fact(i)*u*y[i][0];
}
printf("The value of f(%f) = %f ",p,sum);
getch();
}
```

```

k++;
}
}
printf("\n");
printf("\n x(i)\t y(i)\t y1(i)  y2(i)  y3(i)  y4(i)");
printf("\n");
for(i=0;i<n;i++)
{
printf("\n %.3f",x[i]);
for(j=0;j<n-i;j++)
{
printf(" ");
printf(" %.3f",y[j][i]);
}
printf("\n");
}

i=0;
do
{
if(x[i]<p && p<x[i+1])
k=1;
else
i++;
}while(k != 1);
f=i;
sum=0;
for(i=0;i<n-1;i++)
{
k=f;
temp=1;
for(j=0;j<i;j++)
{
temp = temp * (p - x[k]);
k++;
}
sum = sum + temp*(y[i][f]);
}
printf("\n\n f(%f) = %f ",p,sum);
getch();
}

```