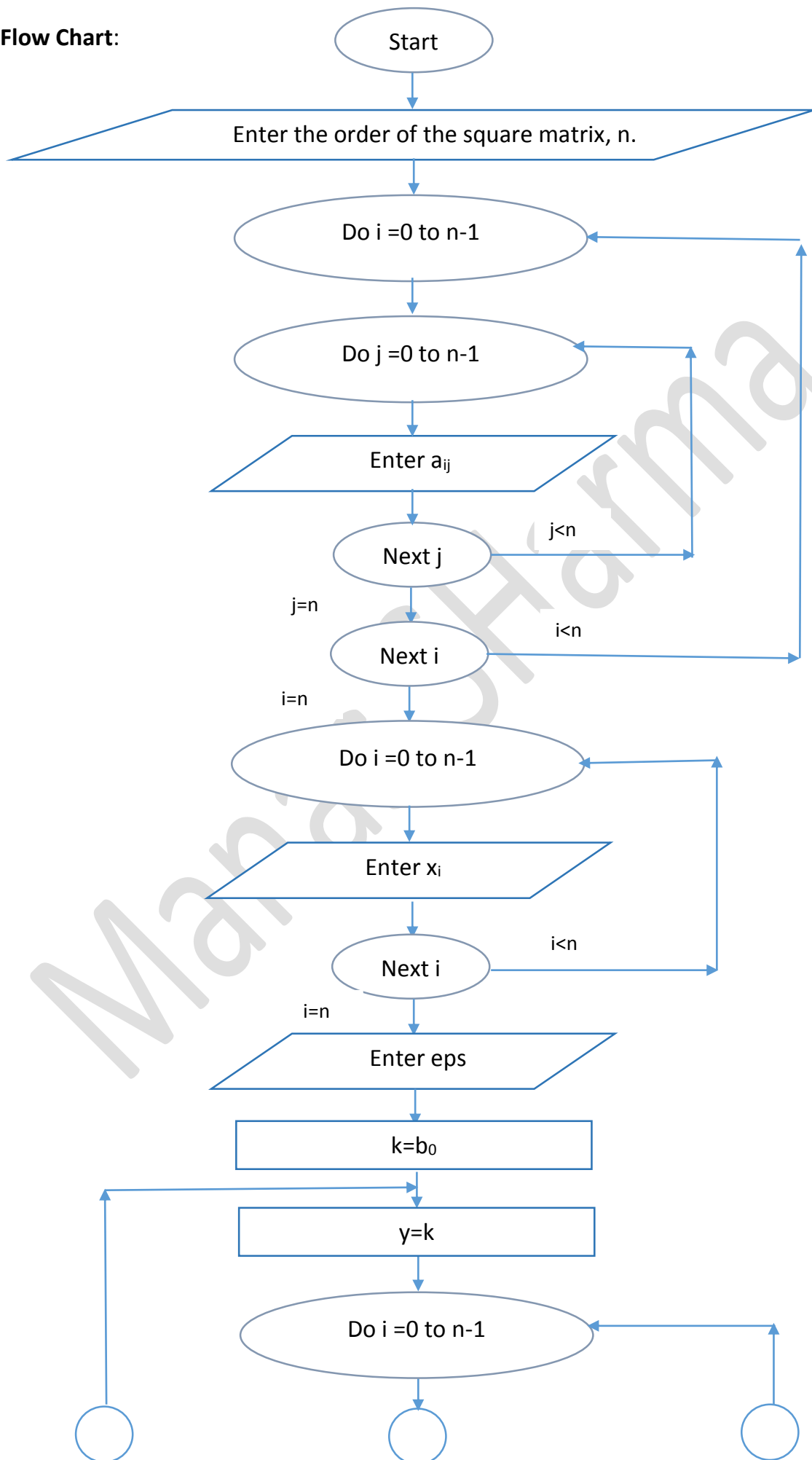


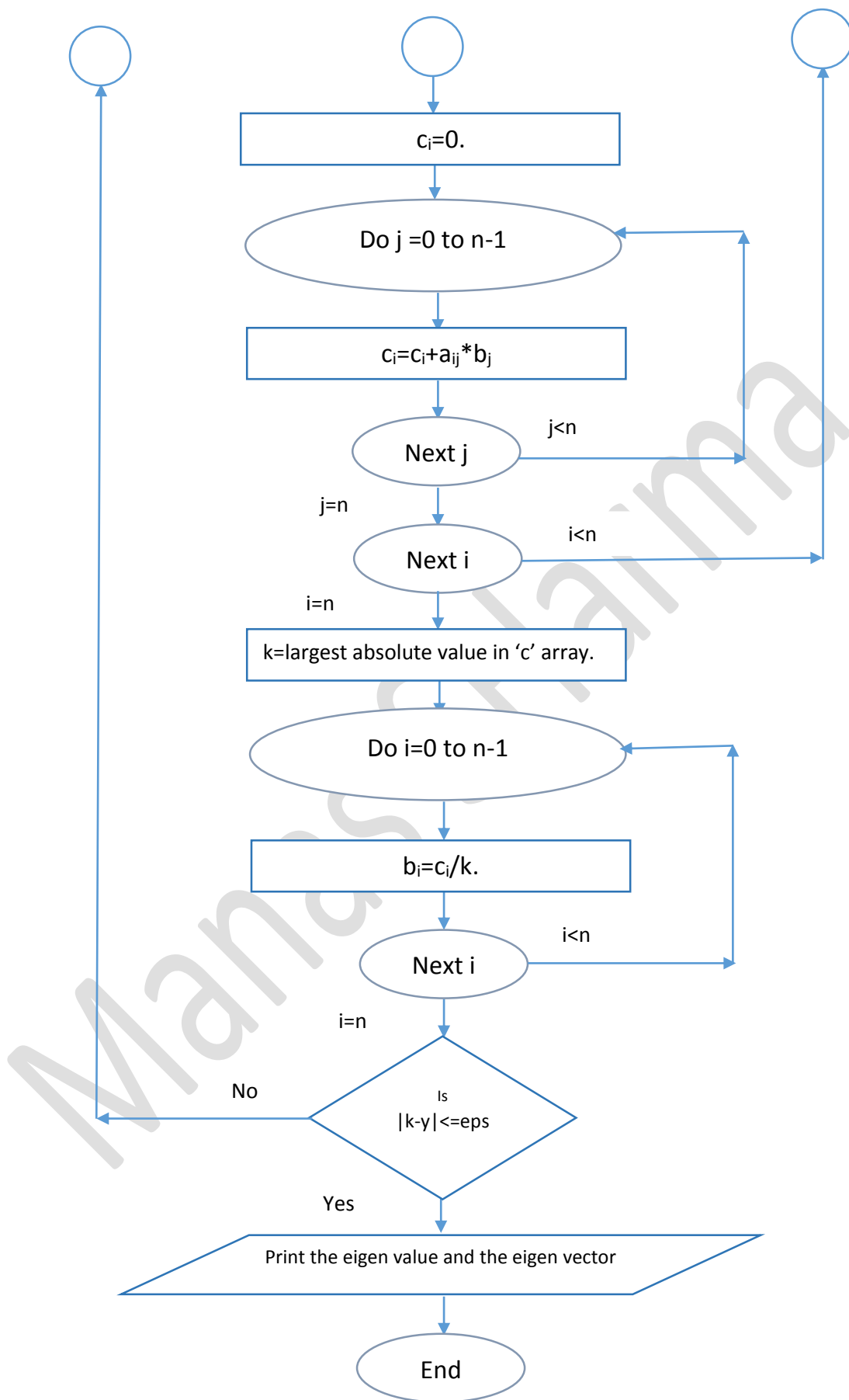
Aim: To find the largest Eigen value and the corresponding Eigen vector of a matrix using iterative method.

Algorithm:

1. Enter the order of the square matrix, n.
2. Enter the elements of the matrix:
Do For i=0 to n-1
 For j=0 to n-1
 Enter a_{ij} .
 End For j
End For i.
3. Enter the initial guess of the Eigen vector:
Do For i=0 to n-1
 Enter x_i .
End For i.
4. Enter the degree of accuracy, eps.
5. $k=b_0$.
6. Do
 $y=k$.
 For i=0 to n-1
 $c_i=0$.
 For j=0 to n-1
 $c_i=c_i+a_{ij}*b_j$
 End For j
 End For i.
7. k =largest absolute value in 'c' array.
8. For i=0 to n-1
 $b_i=c_i/k$.
Until $|k-y| \leq \text{eps}$.
9. Print the eigen value 'k' and the eigen vector 'b'.
10. End.

Flow Chart:





Program:

```
#include<iostream>
#include<iomanip>
#include<cmath>
using namespace std;
int main()
{
    cout.precision(2);
    cout.setf(ios::fixed);
    int n,i,j;
    cout<<"\nEnter the order of the matrix:\n";           //Get the order of
the square matrix
    cin>>n;
    double a[n][n],b[n],c[n],k,eps,y;                    //declare arrays and other
variables to be used
    cout<<"\nEnter the elements of matrix row-wise:\n";
    for (i=0;i<n;i++)                                   //Get the elements of the matrix
        for (j=0;j<n;j++)
            cin>>a[i][j];
    cout<<"\nEnter the initial values of the eigen-vector:\n";
    for (i=0;i<n;i++)                                   //Get the initial guess for the
eigen vector
        cin>>b[i];
    cout<<"\nEnter the accuracy desired:\n";
    cin>>eps;
    k=b[0];                                             //Assign some initial value to the
eigen value, 'k'
    do
    {
        y=k;
        for (i=0;i<n;i++)                               //Calculate axb where a is the
matrix and b its eigen vector
        {
            c[i]=0;
            for (j=0;j<n;j++)
                c[i]=c[i]+a[i][j]*b[j];                //After all the iterations
axb=c
        }
        k=abs(c[0]);
        for (i=1;i<n;i++)
            k=abs(c[i])>k?abs(c[i]):k;                    //Find the largest element of
c and assign it to k where k is the eigen value
        for (i=0;i<n;i++)
            b[i]=c[i]/k;                                  //Calculate the new Eigen Vector
    }while (abs(k-y)>eps);                                //Check if the error in eigen
value is within the tolerance limit
    cout<<"The eigen-value is: "<<k<<endl;
    cout<<"\nAnd the Eigen-vector is [";
    for (i=0;i<n;i++)
        cout<<b[i]<<setw(9);
    cout<<""]\n";
    return 0;
}
```

Output:

```
Enter the order of the matrix:
2

Enter the elements of matrix row-wise:
5      4
1      2

Enter the initial values of the eigen-vector:
1      0

Enter the accuracy desired:
0.001
The eigen-value is: 6.00

And the Eigen-vector is [1.00      0.25      ]
```

```
Enter the order of the matrix:
3

Enter the elements of matrix row-wise:
2      -1      0
-1      2      -1
0      -1      2

Enter the initial values of the eigen-vector:
1      0      0

Enter the accuracy desired:
0.001
The eigen-value is: 3.41

And the Eigen-vector is [0.74      -1.00      0.67      ]
```