PRACTICAL- 1

AIM

Write a program to find the solution of the equation X=*AX* using the eigen value-Eigen vector method.

FUNCTIONS USED

[V, D]=eig(A) – Used to find the eigenvalues and eigenvectors of the matrix A. V gives a matrix with the eigenvectors as its columns. D is a diagonal matrix with eigenvalues as the diagonal elements.

CODE

```
%%linear_DE_system_solver: Solve a system of linear
homogenous DEs
function[sols]=linear_DE_system_solver(A)
syms t
syms lambda
n = length(A);
[V,D]=eig(A);
eigenvalues=diag(D);
consts=reshape(sym('c%d',1:n),n,1);
unique_eigenvalues=unique(eigenvalues);
mults=histc(eigenvalues,unique_eigenvalues);
sols=sym('x%d',[1 n]);
if length(unique_eigenvalues)~=length(eigenvalues)
    %For repeating eigenvalues
    i=1;
    ch_mat=A-lambda*eye(n);
    V=vpa(V);
    while i<=n
        [pos]=find(unique_eigenvalues==eigenvalues(i));
        if mults(pos)>1
            e_vector=V(:,i);
            a_mat=subs(ch_mat,eigenvalues(i));
            for j=1:mults(pos)
                V(:,i)=V(:,i).*(t^(j-1));
```

```
                P=inv(a_mat^(j-1))*e_vector;
                i=i+1;
            end;
        else
            i=i+1;
        end;
    end;
end;
for i=1:n
    sols(i)=(V(i,:).*exp(eigenvalues'*t))*consts;
end;
```

INVOCATION

```
>> practical_1([1 2;3 2])

ans =

[ - (2^(1/2)*c1*exp(-t))/2 - (2*13^(1/2)*c2*exp(4*t))/13,
(2^(1/2)*c1*exp(-t))/2 - (3*13^(1/2)*c2*exp(4*t))/13]
```