Math lab Report

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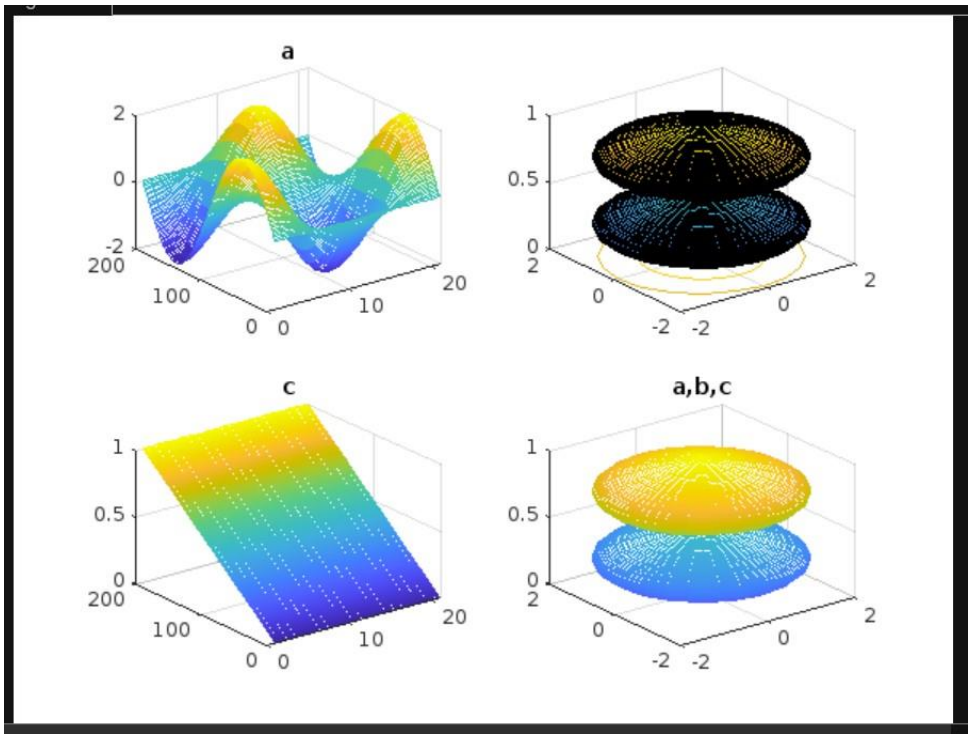
Matlab 1

Q1. Plot the graph of a function in the matlab? Ans -

```
x = 0:pi/100:2*pi; [a b c] = cylinder(2*sin(x));
subplot(2,2,1);mesh(a);title('a');
subplot(2,2,2);mesh(b);title('b');
subplot(2,2,3);mesh(c);title('c');
subplot(2,2,4);mesh(a,b,c);title('a,b,c'); surf(a,b,c) hold on
contour(a,b,c) hold off
```

Output :-

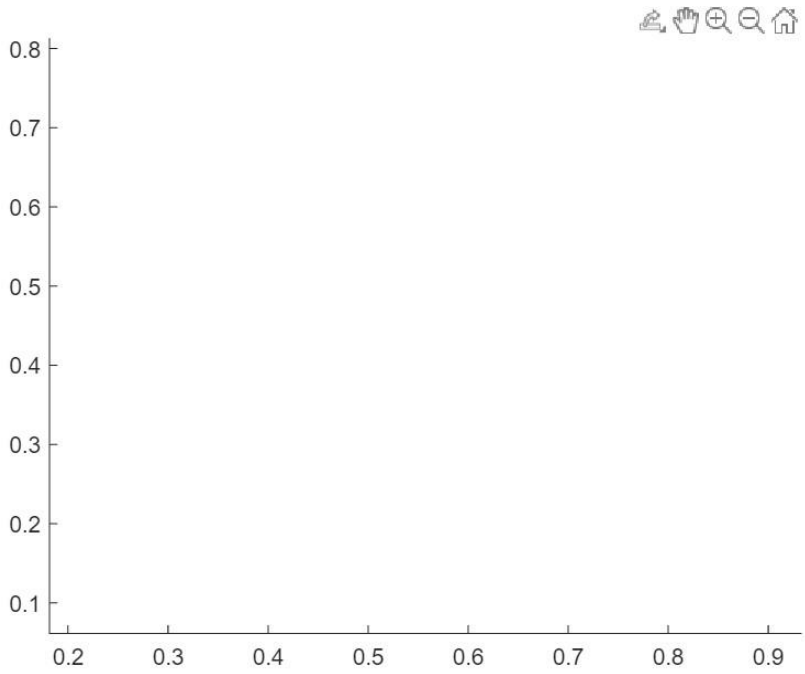


Q2. Plot the 2-D graph using ezplot in matlab? Ans -

```
syms x x = [-2*pi,2*pi] F = ('exp(-
x).*sin(30.*x)'); ezplot(F)
```

```
F = inline('exp(-0.3*x).*sin(30*x)'); ezplot(F)
ezplot('my_f') ezplot('my_f(3*x.^2)')
```

Output -



Matlab 2

Q1. Find the Overall Mean of given Samples? Ans -

```
nsamples = 5; npoints = 50; for k = 1: nsamples
currentData = rand(npoints,1); sampleMean(k) =
mean(currentData); end
overallMean = mean(sampleMean)
```

Output -

```
overallMean =

    0.4910

>>
```

Q2. Find Overall Mean and display message of Overall Mean? Ans -

```
nsamples = 5;

npoints = 50;
```

```
for k = 1: nsamples

currentData = rand(npoints,1);

sampleMean(k) = mean(currentData);

end

overallMean = mean(sampleMean)
```

```
if overallMean < .49

disp('Mean is less than expected')

elseif overallMean > .51

disp('Mean is greater than expected')

else

disp('Mean is within the expected range')

End
```

Output -

```
overallMean = 0.4974




Mean is within the expected range
```

Q3 . Find the sample mean of different iteration?

Ans -

```
nsamples = 5;

npoints = 5;

for k = 1:nsamples
```

```
iterationString = ['Iteration #',int2str(k)];

disp(iterationString)

currentData = rand(npoints,1);

sampleMean(k) = mean(currentData)

end

overallMean = mean(sampleMean)

if overallMean < .49

disp('Mean is less than expected')

elseif overallMean > .51

disp('Mean is greater than expected')

else

disp('Mean is within the expected range')

end
```

Output -

```
Iteration #1
sampleMean = 1×50
      0.6456    0.6117    0.3533    0.4884    0.2392    0.7742 ...

Iteration #2
sampleMean = 1×50
      0.6456    0.4856    0.3533    0.4884    0.2392    0.7742 ...

Iteration #3
sampleMean = 1×50
      0.6456    0.4856    0.7473    0.4884    0.2392    0.7742 ...

Iteration #4
sampleMean = 1×50
      0.6456    0.4856    0.7473    0.5170    0.2392    0.7742 ...

Iteration #5
sampleMean = 1×50
      0.6456    0.4856    0.7473    0.5170    0.4072    0.7742 ...

overallMean = 0.5213
Mean is greater than expected
```

Matlab 3

Q1. Solve the given differential Equation ? Ans -

syms y(x) ode = diff(y,x) == x*y

ySol(x) = dsolve(ode) Output

-

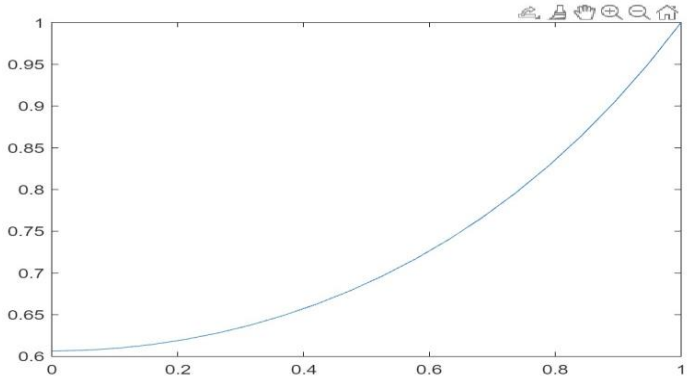
```
ode(x) =

diff(y(x), x) == x*y(x)


ySol(x) =

C1*exp(x^2/2)
```

Q2. Solve the differential Equation and the plot the graph? Ans -

syms y(x) ode1 = diff(y,x) == x*y; cond =
y(1) == 1; ySol(x) = dsolve(ode1,cond) x =
linspace(0,1,20); z =
eval(vectorize(ySol(x))); plot(x,z)

Output -

```
ySol(x) =

exp(-1/2)*exp(x^2/2)

>>
```



Q3. Solve the Matrix?

Ans -

A = [1 1 1 1; 1 2 3 4; 1 3 6 10; 1 4 10 20];
B = [1; -1; 2; 3];
X = A\B

Output -

```
X =

    15
   -33
    26
    -7

>>
```

Q4. Find the Cross product of given question?

Ans -

A=[-5 7 2];
B=[1 5 -2]; AB =
cross(A,B)

Output -

```
AB =

   -24    -8   -32

>>
```

Q5. Find the divergence of Equation ? Ans -

syms x y z
I = [(x^2)*y (y^2)*z+(z^2)*x 6*y+8*z];
J = [x y z];
IJ = divergence(I,J)

Output -

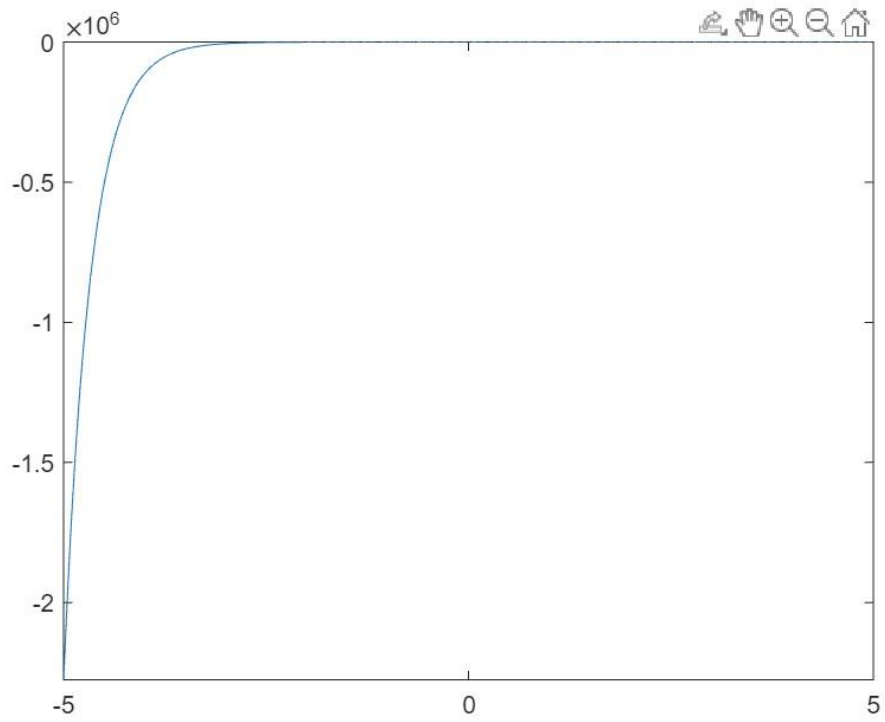
```
IJ =

2*x*y + 2*y*z + 8

>>
```

Q6. Solve differential equation with given condition and plot the graph?

Ans -

syms y(x) Dy = diff(y,x); ode = diff(y,x,2)+5*(diff(y,x,1))+6*y == cos(x);
cond1 = y(0) == 0; cond2 = Dy(0) == 1; conds = [cond1 cond2]; ySol(x) =
dsolve(ode,cond1,conds) fplot(ySol(x)) **Output -**

```
ySol(x) =

(3*exp(-2*x))/5 - (7*exp(-3*x))/10 + (2^(1/2)*cos(x - pi/4))/10

>>
```



Q6. Solve differential equation with using eval vectorize in matlab and plot graph? Ans -

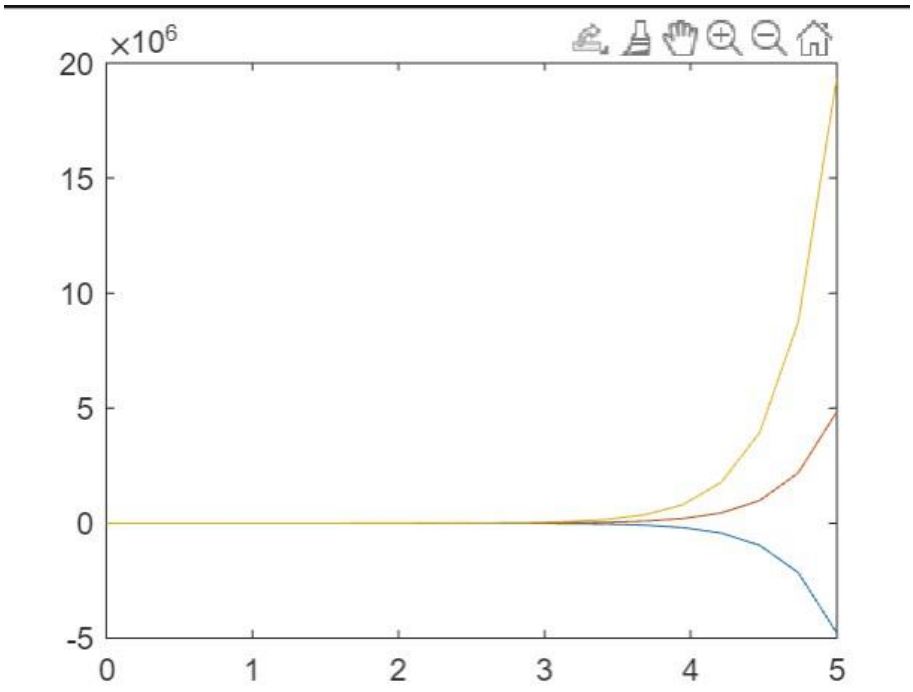
syms x y z Dx Dy Dz

inits = 'x(0) =1,y(0)=2,z(0)=1'

[x,y,z] = dsolve('Dx = x+2*y-z', 'Dy = x+z' , 'Dz = 4*x-4*y+5*z',inits) t = linspace(0,5,20); xx = eval(vectorize(x)); yy = eval(vectorize(y)); zz = eval(vectorize(z)); plot(t,xx,t,yy,t,zz)

Output -

```
z =

6*exp(3*t) - 12*exp(2*t) + 7*exp(t)
```



Matlab 4

Q1. Solve differential equation with expansion point and Order? Ans -

```
syms y(x) t Dy(x)=diff(y(x),x);
eqn = diff(y,2)+9*diff(y,1) == sin(2*t);
dsolve(eqn,'ExpansionPoint',0,'Order',6,y(0)==1,Dy(0)==1)
```

Output -

```
ans =

(2187/40 - (243*sin(2*t))/40)*x^5 + ((27*sin(2*t))/8 - 243/8)*x^4 + (27/2 - (3*sin(2*t))/2)*x^3 + (sin(2*t)/2 - 9/2)*x^2 + x + 1

>>
```

Q2. Solve differential Equation? Ans -

```
syms y(x) t D2y Dy eqn =
input('D2y+9*y=sin(2*t)'); inits =
input('y(0)=0,Dy(0)=1'); y =
dsolve(eqn,inits,'x') fplot(y)
```

Output -

```
D2y+9*y=sin(2*t)
>>
```

Q3. Solve differential equation? Ans -

```
syms y(x) Dy(x)=diff(y(x),x); eqn = diff(y,2)-
x*diff(y,1)+2*y == 0;
dsolve(eqn,'ExpansionPoint',0,'Order',6,y(0)==1,Dy(0)==1)
```

Q4. Solve differential equation? Ans -

```
syms y(x) eqn = diff(y,2)-x*diff(y,1)+2*y == 0;
dsolve(eqn,'ExpansionPoint',0,'Order',6,y(0)==1,Dy(0)==1)
```

Matlab 5

Q1. Find the Eigen Values of given equation? Ans -

```
syms x1(t) x2(t) x3(t)

A=[2 -2 1;-1 3 -1;-2 -4 3];

cond10 = x1(0) == 1;

cond20 = x2(0) == 0;

cond30 = x3(0) == 0;

cond = [cond10;cond20;cond30];

[P lambda] = eig(A);

P = round(P,5);

fprintf('Eigen values of A are %f, %f, %f \n',lambda);

disp('The Modal Matrix is:');

disp(P);

if(rank(P)~=length(P))

    fprintf('The matrix is not diagonlizable, thus solution is not
possible using this method \n')

    return

end

D = inv(P)*A*P;

D=round(D,5);
```

```
X = [x1(t);x2(t);x3(t)];
for i=1:length(A)
    eqs = diff(X(i),t,2)-D(i,i)*X(i)==0;
    bc = cond(i,:);
Sol(i)=dsolve(eqs,bc);
end
disp('The solution of the system diff(X,2)+DX=0 is: ');
disp(Sol);
disp('The Solution of the given system is: ');
Y = P*Sol' %[Sol1;Sol2;Sol3]
fplot(Y,[1 20])
```

Output -

```
Eigen values of A are 2.000000, 0.000000, 0.000000
Eigen values of A are 0.000000, 1.000000, 0.000000
Eigen values of A are 0.000000, 0.000000, 5.000000
The Modal Matrix is:
    0.4083         0    0.5774
   -0.4083   -0.4472   -0.5774
   -0.8165   -0.8944    0.5774
```

The solution of the system diff(X,2)+DX=0 is:

$$\begin{pmatrix} C_1 e^{-\sqrt{2}t} - e^{\sqrt{2}t}(C_1 - 1) & C_1 e^{-t}(e^{2t} - 1) & -C_1 e^{-\sqrt{5}t}\left(e^{2\sqrt{5}t} - 1\right) \end{pmatrix}$$

The Solution of the given system is:

Y =

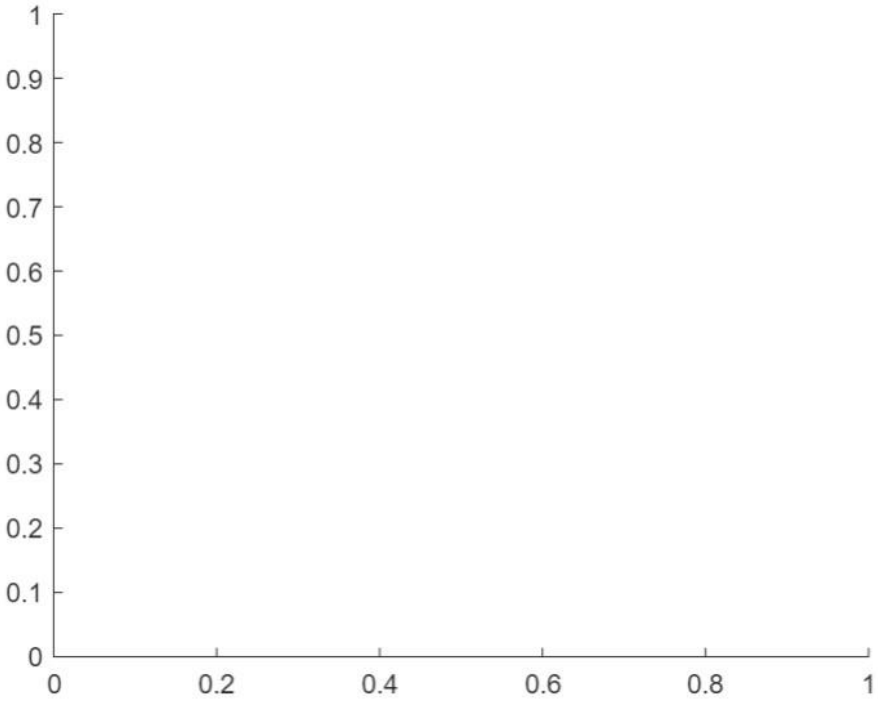
$$\begin{pmatrix} \sigma_2 - \frac{\sigma_3}{4000} - \sigma_1 \\ \frac{\sigma_3}{4000} - \sigma_2 + \sigma_1 - \frac{44721\, e^{-\bar{t}}\, \overline{C_1}\, \left(e^{2\bar{t}} - 1\right)}{100000} \\ \frac{\sigma_3}{2000} - \frac{1633\, e^{-\sqrt{2}\bar{t}}\, \overline{C_1}}{2000} - \sigma_1 - \frac{89443\, e^{-\bar{t}}\, \overline{C_1}\, \left(e^{2\bar{t}} - 1\right)}{100000} \end{pmatrix}$$

where

$$\sigma_1 = \frac{11547\, e^{-\sqrt{5}\bar{t}}\, \overline{C_1}\, \left(e^{2\sqrt{5}\bar{t}} - 1\right)}{20000}$$

$$\sigma_2 = \frac{1633\, e^{-\sqrt{2}\bar{t}}\, \overline{C_1}}{4000}$$

$$\sigma_3 = 1633\, e^{\sqrt{2}\bar{t}}\, \left(\overline{C_1} - 1\right)$$


1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
0
0.2
0.4
0.6
0.8
1

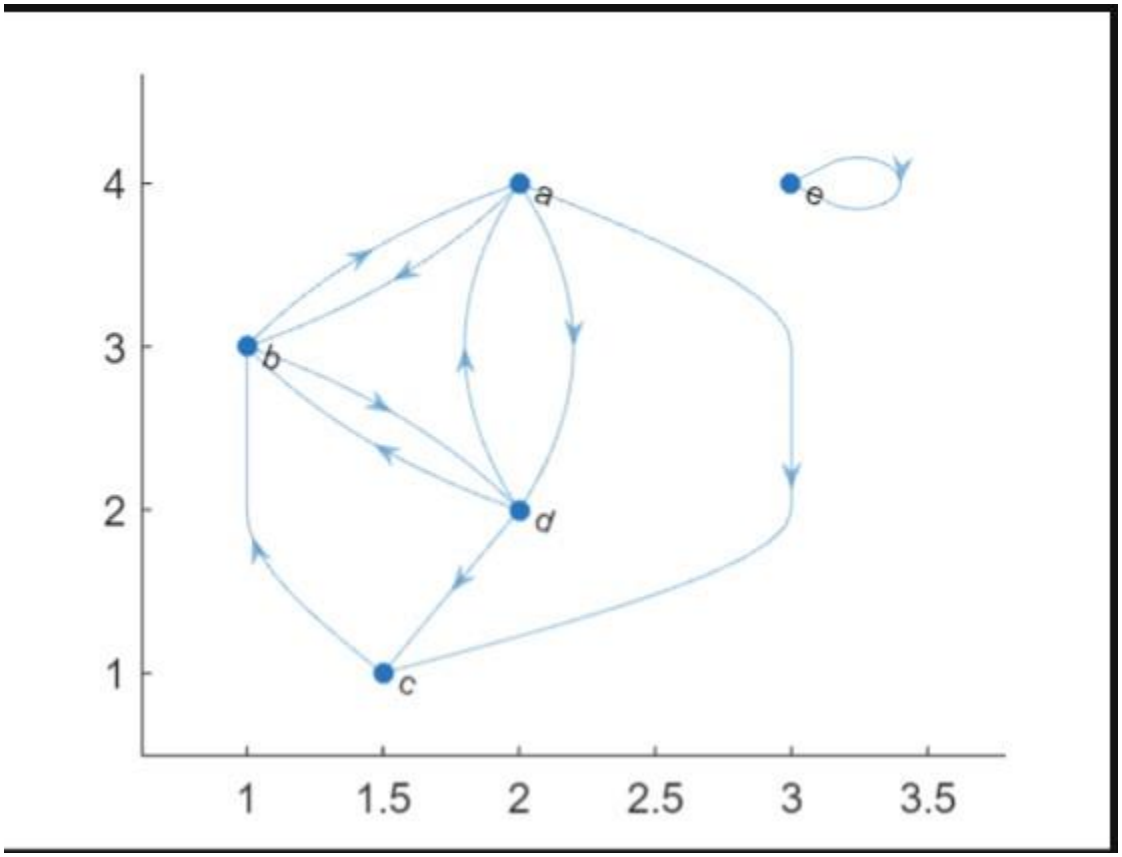
Matlab 6

Q1. Solve Google Page Rank?

Ans -

```
A={};

B={'b' 'c' 'd' 'd' 'a' 'b' 'c' 'a' 'b'};

G = digraph(A,B);

labels = {'a/3' 'a/3' 'a/3' 'b/2' 'b/2' 'c' 'd/3' 'd/3' 'd/3'};

p = plot(G,'Layout','layered','EdgeLabel',labels);

highlight(p,[1 1 1],[2 3 4],'EdgeColor','g')

highlight(p,[2 2],[1 4],'EdgeColor','r')

highlight(p,3,2,'EdgeColor','m')

title('PageRank Score Transfer Between Nodes')
```

Output -



Q2. Solve Page Rank Matrix?

Ans -

```
A=[0 1/2 0 1/3 1 1/3 ; 0 0 1/4 1/4 1/4 1/4 ; 0 0 0 1/2 1/2 0 ; 1/3 0 1/3
0 1/3 1/3 ; 1 0 0 0 0 0 ; 1/3 1/3 0 0 1/3 0];

[V,D] = eigs(A);

u = V(:,1);

x = u/sum(u);

disp("Page Rank Matris is :-")

disp(x)
```

Output -

```
Page Rank Matris is :-
    0.2552
    0.1154
    0.1323
    0.1737
    0.1871
    0.1363
```

Matlab 7

Q1. Solve Bessel Equation?

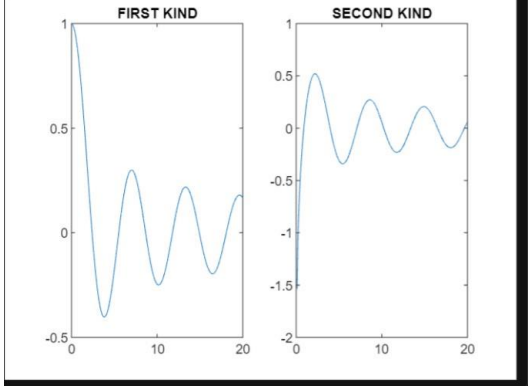
Ans -

```
syms x a0 a1 a2 a3 a4 m c1 c2

y = a0*x^m+a1*x^(m+1)+a2*x^(m+2)+a3*x^(m+3)+a4*x^(m+4);

eq = 4*x^2*diff(y,x,2)+4*x*y+(64*x^2-9)*y==0;

eq1 = collect(eq);

eq2 = coeffs(simplify(eq1*x^(1-m)),x);

X = 0:0.1:20;

Y = zeros(5,numel(X));

J = zeros(5,numel(X));

Y0 = bessely(0,X)
```

```
J0 = besselj(0,X)

subplot(1,2,1),plot(X,J0)

title('FIRST KIND')

subplot(1,2,2),plot(X,Y0)

title('SECOND KIND')
```

Output -

```
Y0 = 1×201
       -Inf   -1.5342   -1.0811   -0.8073   -0.6060   -0.4445 ...

J0 = 1×201
    1.0000    0.9975    0.9900    0.9776    0.9604    0.9385 ...
```



Matlab 8

Q1. Solve z-transformation?

Ans -

```
syms z Y n positive

n=10;

LHS = ztrans(sym('y(n+2)')-sym('y(n+1)')-sym('y(n)'),n,z);

RHS = ztrans(0,n,z)

newLHS = subs(LHS,{'ztrans(y(n),n,z)','y(0)','y(1)'},{Y,0,1});

Y = solve(newLHS-RHS,Y);

y=iztrans(Y,z,n)
```

Q2. Solve?

Ans -

```
syms n k1 k2 m

assume(n,'integer')

a = input('Enter the coefficient of y(n+2):');

b = input('Enter the coefficient of y(n+1):');

c = input('Enter the coefficient of y(n):');

d = input('Enter the non-homogenous part:');

r = subs(solve(a*m^2+b*m+c,m));

if imag(r)~=0

    rho = sqrt(real(r(1))^2 + imag(r(1))^2);

    theta = atan(abs(imag(r(1)))/real(r(1)));

            y1 = (rho^n)*cos(n*theta);

            y2 = (rho^n)*sin(n*theta);

elseif r(1)==r(2)

    y1 = r(1)^n;

    y2 = n*r(1)^n;

else

    y1 = r(1)^n;

    y2 = r(2)^n;

end
```

Output -

```
use
'str2sym'.

Error in sym>tomupad (line 1608)
        S = convertChar(x);

Error in sym (line 400)
              S.s = tomupad(x);
```

Matlab 9

Q1. Solve Z-transformation?

```
disp('The Modal Matrix is:');

disp(P);

m1=1;

m2=1;

k1=3;

k2=2;
```

```
D = inv(P)*A*P;
```

Ans -

```
syms z Y n positive

n=10;

z=5;

LHS = ztrans(sym('y(n+2)')-sym('y(n+1)')-sym('y(n)'),n,z);

RHS = ztrans(0,n,z)

newLHS = subs(LHS,{'ztrans(y(n),n,z)','y(0)','y(1)'},{Y,0,1});

Y = solve(newLHS-RHS,Y);

y = iztrans(Y,z,n)
```

Output -

```
Error in sym>tomupad (line 1608)
        S = convertChar(x);

Error in sym (line 400)
                S.s = tomupad(x);
```

Q2. Solve solution of differential Equation?

Ans -

```
syms x1 x2 t c
x1 = m1*diff(x1,t,2)+c(diff(x1,t,1)-diff(x2,t))+k1(x1-x2);

x1 = m2*diff(x2,t,2)+c(diff(x1,t,1)-diff(x1,t))+k1*x2==k2;

X = [x1;x2];

Sol1 = dsolve(diff(x1,2) + D(1)*x1==0);

Sol2 = dsolve(diff(x2,2) + D(4)*x2==0);

disp('The solution of the system diff(X,2)+DX=0 is :');

disp(Sol1);

disp(Sol2);
```

```
disp('The Solution of the given system is: ');

Y = P*[Sol1;Sol2]
```

Output -

```
The Modal Matrix is:

P

Array
indices
must
be
positive
integers
or
logical
values.

Error in indexing (line 1075)
            R_tilde = builtin('subsref',L_tilde,Idx);
```

Matlab 10

Q1. Solve differential Equation?

Ans -

```
syms y(t)

ode = diff(y,t,2) - 5*diff(y,t) + 6*y == sin(3*t);

ySol(t) = dsolve(ode)
```

Output -

```
ySol(t) =
```

$$\frac{\sqrt{26}\cos\left(3t+\operatorname{atan}\left(\frac{1}{5}\right)\right)}{78}+C_1\,e^{2t}+C_2\,e^{3t}$$

Q2. Solve inverse of Z-transformation ?

Ans -

```
syms z
```

```
F = 2*z/(z-2)^2;

iztrans(F)
```

Output -