**MATLAB REPORT**

**NAME : PRATHAPANI SATWIKA**

**REG.NO. : 20BCD7160**

**TOPIC DATE**

1. **INTRODUCTION TO MATLAB 12/01/2021**

**2. FLOW CONTROL AND 15/01/2021**

**CONDITIONAL STATEMENTS**

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**4.APPLICATION OF INTEGRALS 20/01/2021**

**5. VECTOR CALCULUS 21/01/2021**

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**INTEGRALS**

**7. SOLVING DIFFERENTIAL 27/01/2021**

**EQUATIONS**

**8. SOLVING ODE’s USING 28/01/2021**

**LAPLACE TRANSFORM**

**9.FINAL REPORT SUBMISSION 11/02/2021**

**1. MATLAB ONRAMP CERTIFICATE :**



**EXPERIMENT NO. 1**

**FLOW CONTROL AND CONDITIONAL STATEMENTS**

Q1. Plot a circle of given radius with center (h , k). Input the numerical values for h, k and r.

% Circle equation: (x-h)^2 + (y-k)^2 = r^2

% Center: (h,k) Radius: r

h = 1;

k = 1;

r = 1;

xmin = h - r;

xmax = h + r;

x\_res = 1e-3;

X = xmin:x\_res:xmax;

N = length(X);

x = [X flip(X)];

ytemp1 = zeros(1,N);

ytemp2 = zeros(1,N);

for i = 1:1:N

square = sqrt(r^2 - X(i)^2 + 2\*X(i)\*h - h^2);

ytemp1(i) = k - square;

ytemp2(N+1-i) = k + square;

end

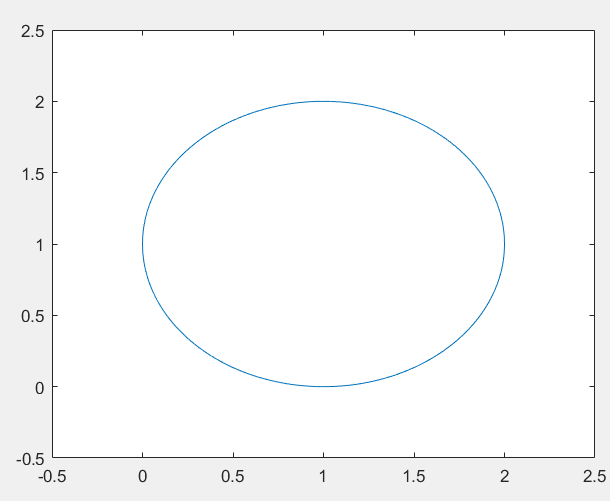
y = [ytemp1 ytemp2];

c = 1.5;

figure(1)

plot(x,y)

axis([h-c\*r h+c\*r k-c\*r k+c\*r]);



Q2. Write a matlab code to print your name if the last two digits of your roll number form an even number, otherwise plot a circle centered at origin having radius as the last two digits of your roll number.

**CODE :**

% Circle equation: (x-h)^2 + (y-k)^2 = r^2

% Center: (h,k) Radius: r

h = 0;

k = 0;

r = 60;

xmin = h - r;

xmax = h + r;

x\_res = 1e-3;

X = xmin:x\_res:xmax;

N = length(X);

x = [X flip(X)];

ytemp1 = zeros(1,N);

ytemp2 = zeros(1,N);

for i = 1:1:N

square = sqrt(r^2 - X(i)^2 + 2\*X(i)\*h - h^2);

ytemp1(i) = k - square;

ytemp2(N+1-i) = k + square;

end

y = [ytemp1 ytemp2];

c = 1.5;

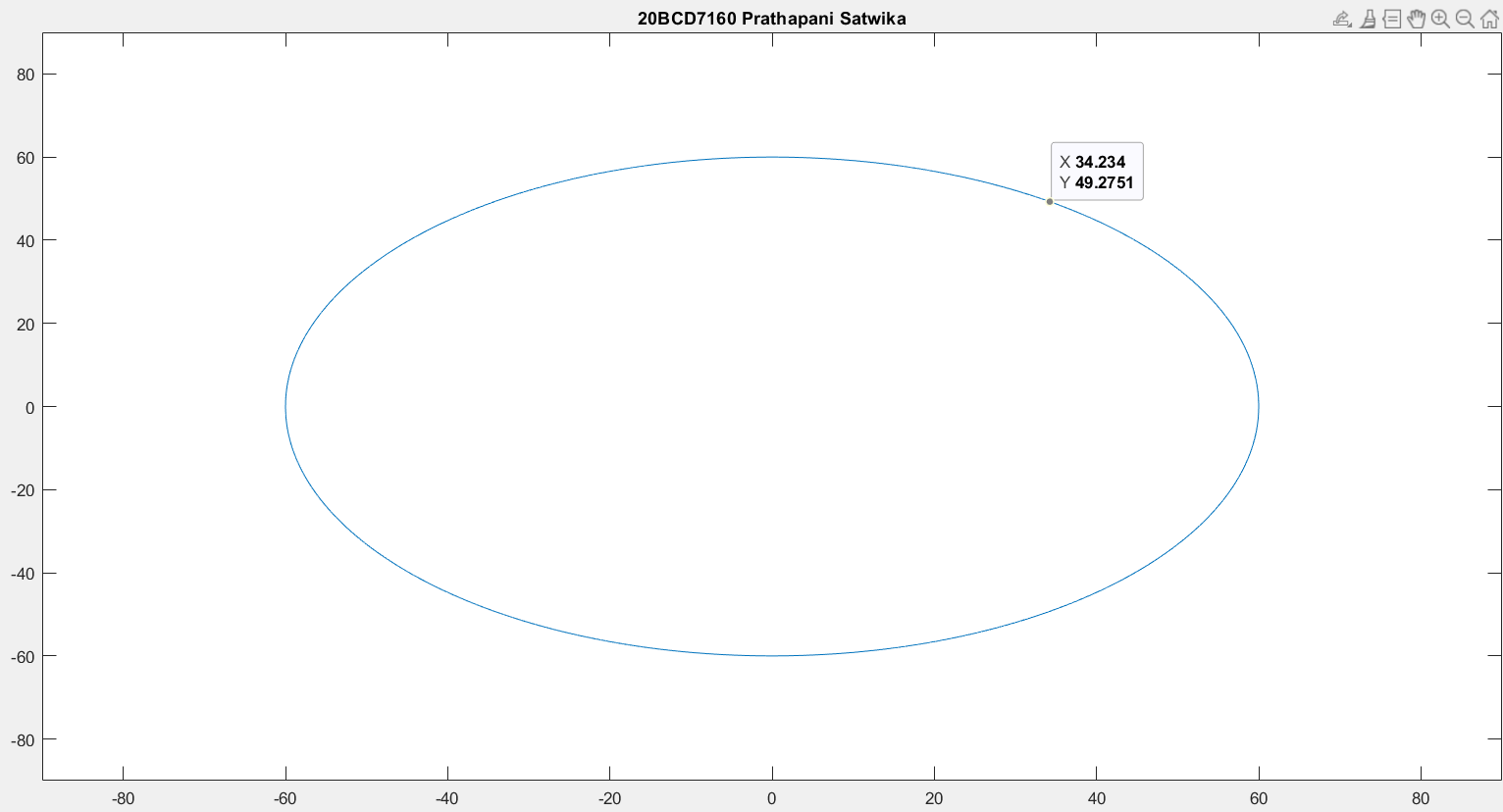
figure(1)

plot(x,y)

axis([h-c\*r h+c\*r k-c\*r k+c\*r]);

title('20BCD7160 Prathapani Satwika')

**OUTPUT :**



**EXPERIMENT NO. : 2**

**APPLICATIONS TO DERIVATIVES**

**Question 1:** A box with an open top is to be constructed from a rectangular piece of cardboard with dimensions 12 in. by 20 in. by cutting out equal squares of side x at each corner and then folding up the sides as in the figure. Find x so that the volume is maximum.

**CODE :**

%clc

%clear all

syms x

f=x\*(12-2\*x)\*(20-2\*x);

df=diff(f);

roots = solve(df==0);

ddf=diff(df);

ddfval=subs(ddf, x, roots);

for i=1:length(ddfval)

if ddfval(i)<0

fprintf('f is maximum')

xmaxvalue=double(roots(i))

fmax=subs(f, x, roots(i))

maxvolume=double(fmax)

else

fprintf('f is minimum')

xminvalue=double(roots(i))

fmin=subs(f, x, roots(i))

minvolume=double(fmin)

end

end

**OUTPUT :**

f is maximum

xmaxvalue =

2.4274

fmax =

-((4\*19^(1/2))/3 + 4/3)((2\*19^(1/2))/3 - 16/3)((4\*19^(1/2))/3 + 28/3)

maxvolume =

262.6823

f is minimum

xminvalue =

8.2393

fmin =

((4\*19^(1/2))/3 - 4/3)((2\*19^(1/2))/3 + 16/3)((4\*19^(1/2))/3 - 28/3)

minvolume =

-129.9415

**Question 2 :**  An open rectangular box with the square base is to be made from 48ft^2 of material. What dimensions will result in a box with the largest possible volume?

**CODE :**

clc

clear all

syms x y L;

f=(x^2)\*y;

diff\_f=gradient(f, [x, y]);

fx=diff\_f(1);

fy=diff\_f(2);

g=(x^2+4\*x\*y)-67;

diff\_g=L\*gradient(g, [x, y]);

gx=diff\_g(1);

gy=diff\_g(2);

eqns=[fx-gx==0,fy-gy==0,g==0];

vars=[x y L]

[sol\_x, sol\_y, sol\_L] = solve(eqns, vars);

xyL\_Values= [sol\_x(:), sol\_y(:), sol\_L(:)]

[m,n]=size(xyL\_Values);

for i=1:m

result(i)=subs(f,[x,y,L],xyL\_Values(i,:))

end

result;

f\_min=min(result);

ind\_fmin=find(result==f\_min);

f\_max=max(result)

ind\_fmax=find(result==f\_max);

mvar=xyL\_Values(ind\_fmax,:)

**OUTPUT :**

vars =

[x, y, L]

xyL\_Values =

[-201^(1/2)/3, -201^(1/2)/6, -201^(1/2)/12]

[ 201^(1/2)/3, 201^(1/2)/6, 201^(1/2)/12]

result =

-(67\*201^(1/2))/18

result =

[-(67\*201^(1/2))/18, (67\*201^(1/2))/18]

f\_max =

(67\*201^(1/2))/18

mvar =

[201^(1/2)/3, 201^(1/2)/6, 201^(1/2)/12]

>>

**EXPERIMENT NO. : 3**

**APPLICATION TO INTEGRALS**

Q1. Find the mass of a plate bounded by 𝑦 = 𝑥 and 𝑥 = 1, with density µ(𝑥, 𝑦) = 3 − 𝑥 − 𝑦. Print the output with your name and roll number.

**CODE :**

clc

clear all

syms x y

fprintf('20BCD7160 Prathapani Satwika')

int(int(3-x-y,x,y,1),y,0,1)

**OUTPUT :**

20BCD7160 Prathapani Satwika

ans =

1

>>

Q2. Find the volume of the region D enclosed by the surfaces 𝑧 = 𝑥 2 +3𝑦 2 and 𝑧 = 8 − 𝑥 2 − 𝑦 2 .

**CODE :**

clc

clear all

syms x y z

fprintf('20BCD7160 Prathapani Satwika')

int(int(int(1,z,(x^2)+3\*(y^2),8-(x^2)-(y^2)),...

x,-sqrt(4-2\*(y^2)),sqrt(4-2\*(y^2))),y,-sqrt(2),sqrt(2))

**OUTPUT :**

20BCD7160 Prathapani Satwika

ans =

8\*pi\*2^(1/2)

>>

Q3. Find average value of 𝐹(𝑥, 𝑦, 𝑧) = 𝑥𝑦𝑧 throughout the cubical region D bounded by the coordinate planes 𝑥 = 2, 𝑦 = 2, and 𝑧 = 2 in the first octant.

**CODE :**

clc

clear all

syms x y z xyz

fprintf('20BCD7160 Prathapani Satwika')

vol=int(int(int(1,z,0,2),y,0,2),x,0,2)

avg=(1/vol)\*int(int(int(x\*y\*z,z,0,2),y,0,2),x,0,2)

**OUTPUT :**

20BCD7160 Prathapani Satwika

vol =

8

avg =

1

>>

**EXPERIMENT NO. : 4**

**VECTOR CALCULUS**

Q1. Find the gradient of the function 𝑓 = 𝑥𝑦𝑧 and curl and divergence of vector field 𝑭 = 𝑥 2𝑦𝒊 + 𝑦𝒋 + 𝑥𝑦𝒌.

**CODE :**

clc

clear all

syms x y z

f=x\*y\*z;

F=[(x^2)\*y,y,y\*z];

vars=[x, y, z];

fprintf('20BCD7160 Prathapani Satwika')

grad=gradient(f, vars)

divf=divergence(F, vars)

curlf=curl(F, vars)

**OUTPUT :**

20BCD7160 Prathapani Satwika

grad =

y\*z

x\*z

x\*y

divf =

y + 2\*x\*y + 1

curlf =

z

0

-x^2

>>

Q2. Find the directional derivative of the function 𝑓 = 𝑥 cos(𝑦𝑧) at point (−1,2,1) in the direction of the vector, 2𝑖 + 𝑗 + 3𝑘. Print the output with your roll number and name.

**CODE :**

clc

clear all

syms x y z

f=x\*cos(y\*z);

vars=[x, y, z];

P=[-1,2,1];

u=[2,1,3];

norm(u);

unitu =u./norm(u);

fprintf('20BCD7160 Prathapani Satwika')

grad = gradient(f, vars)

gradval=subs(grad, vars, P);

DirDer = double(dot(gradval,unitu))

**OUTPUT :**

20BCD7160 Prathapani Satwika

grad =

cos(y\*z)

-x\*z\*sin(y\*z)

-x\*y\*sin(y\*z)

DirDer =

1.4787

>>

Q3. Draw the two dimensional vector field for the vector 𝑥 2𝑦𝒊 + 𝑥𝑦𝒋.

**CODE :**

clc

clear all

syms x y

f1 = inline((x^2)\*y,'x','y');

f2 = inline(x\*y,'x','y');

x = linspace(-1, 1, 10);

y = x;

[X,Y] = meshgrid(x,y);

U = f1(X,Y);

V = f2(X,Y);

quiver(X,Y,U,V,1)

view(-30,60);

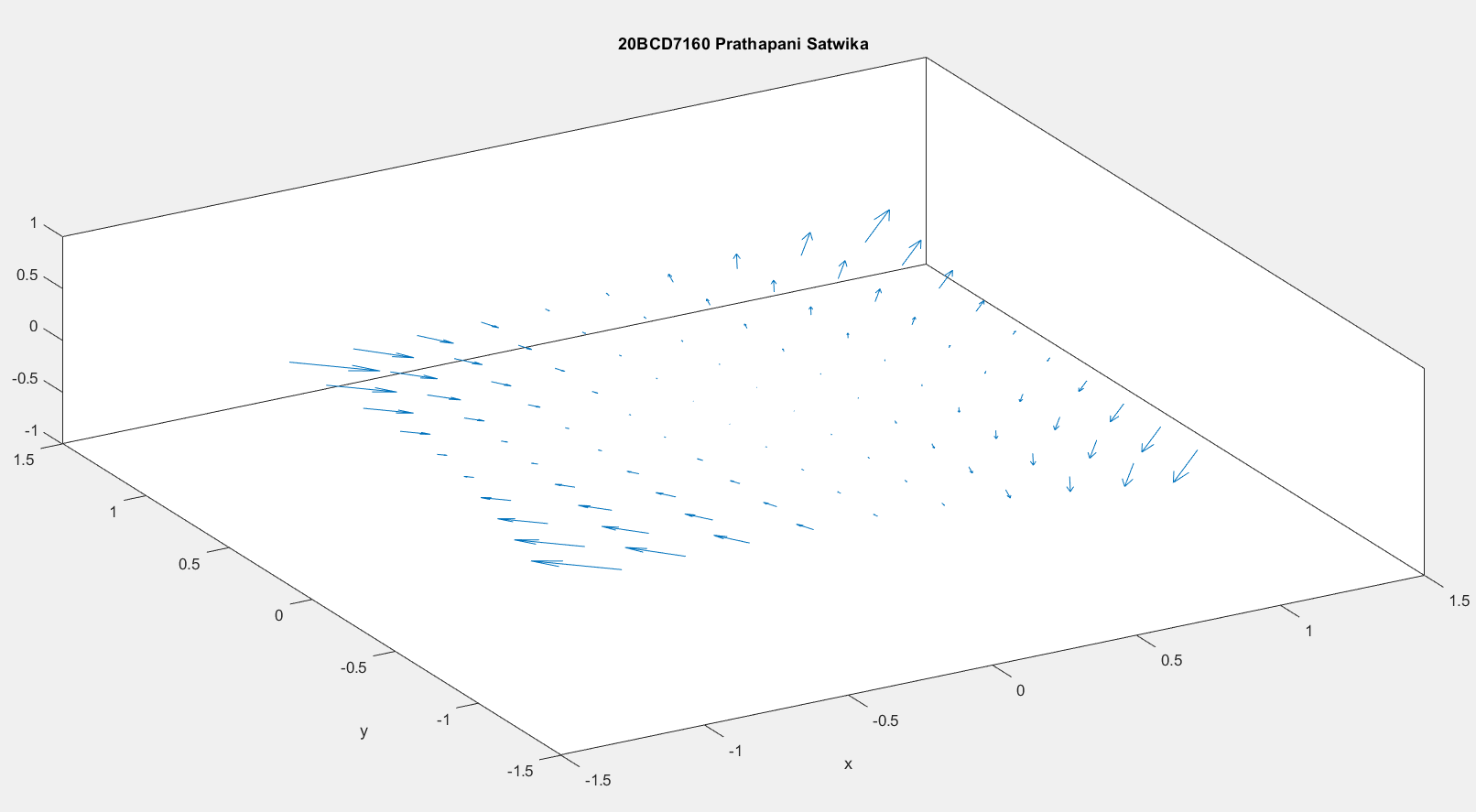
axis on

xlabel('x')

ylabel('y')

title('20BCD7160 Prathapani Satwika')

**OUTPUT :**



**EXPERIMENT NO . : 5**

**APPLICATION TO VECTOR INTEGRALS**

Q1. Integrate 𝑓 (𝑥, 𝑦, 𝑧) = 𝑥 − 3𝑦 2 + 𝑧 over the line segment 𝐶 joining the origin to

the point (1, 1, 1).

**CODE :**

clc

clear all

syms x y z t

f=x-3\*(y^2)+z;

var=[x,y,z];

Par=[t,t,t];

F=subs(f,var,Par);

dr=[diff(Par(1),t),diff(Par(2),t),diff(Par(3),t)];

modr=norm(dr);

I = int(F\*modr,t,0,1);

fprintf('20BCD7160 Prathapani Satwika \n')

disp('Line integral along the given curve is')

disp(I)

**OUTPUT :**

20BCD7160 Prathapani Satwika

Line integral along the given curve is

0

>>

Q2. Evaluate the line integral of 𝑭 (𝑥, 𝑦, 𝑧 ) = 𝑧𝒊 + 𝑥𝑦𝒋 − 𝑦 2𝒌 along the curve 𝐶 given by 𝒓 𝑡 = 𝑡 2 𝒊 + 𝑡𝒋 + 𝑡 𝒌, 0 ≤ 𝑡 ≤ 1.

**CODE :**

clc

clear all

syms t

x = t^2;

y = t;

z = sqrt(t);

f=[z,x\*y, -(y^2)];

r = [x,y,z];

dr = [diff(r(1),t),diff(r(2),t),diff(r(3),t)];

F = dot(f,dr);

I = int(F,t,0,1);

fprintf('20BCD7160 Prathapani Satwika\n');

disp('Line integral along the given curve is')

disp(I)

**OUTPUT :**

20BCD7160 Prathapani Satwika

Line integral along the given curve is

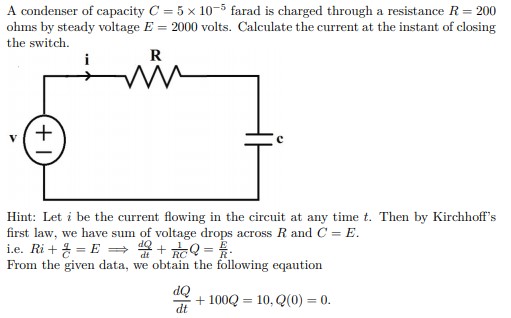
17/20

>>

**EXPERIMENT NO. : 6**

**SOLVING DIFFERENTIAL EQUATIONS**

Q1.



**CODE :**

clc

clear all

syms Q(t)

ode=diff(Q,t,1)+100\*Q==10;

cond1 = Q(0) == 0;

fprintf('20BCD7160 Prathapani Satwika')

QSol(t)=dsolve(ode,cond1)

current=diff(QSol(t))

**OUTPUT :**

**20BCD7160 Prathapani Satwika**

**QSol(t) =**

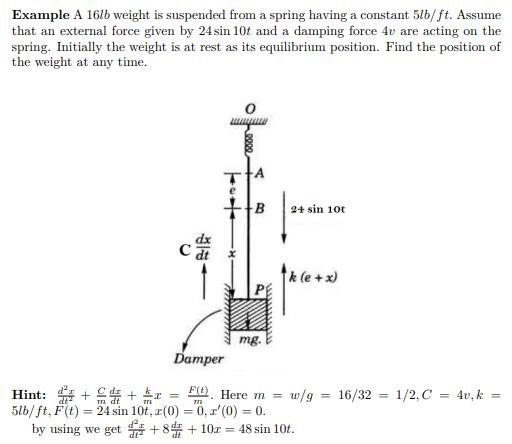
**1/10 - exp(-100\*t)/10**

**current =**

**10\*exp(-100\*t)**

**>>**

**Q2.**



**CODE :**

clc

clear all

syms x(t)

ode=diff(x,t,2) + 8\*diff(x,t,1) + 10\*x == 48\*sin(10\*t);

m = diff(x,t,1);

cond1 = x(0)==0;

cond2 = m(0)==0;

Array = [cond1, cond2];

fprintf('20BCD7160 Prathapani Satwika')

position(t) = dsolve(ode,Array)

**OUTPUT :**

20BCD7160 Prathapani Satwika

position(t) =

(4\*6^(1/2)\*exp(4\*t + 6^(1/2)\*t)\*exp(-t\*(6^(1/2) + 4))\*(10\*cos(10\*t) - sin(10\*t)\*(6^(1/2) + 4)))/((6^(1/2) + 4)^2 + 100) - (4\*6^(1/2)\*exp(4\*t - 6^(1/2)\*t)\*exp(t\*(6^(1/2) - 4))\*(10\*cos(10\*t) + sin(10\*t)\*(6^(1/2) - 4)))/((6^(1/2) - 4)^2 + 100) - (20\*6^(1/2)\*exp(t\*(6^(1/2) - 4)))/(4\*6^(1/2) - 61) + (20\*6^(1/2)\*exp(-t\*(6^(1/2) + 4))\*(488\*6^(1/2) - 3817))/((4\*6^(1/2) - 61)^2\*(4\*6^(1/2) + 61))

**>>**

# **EXPERIMENT NO. : 7**

# **SOLVING ODE’S USING LAPLACE TRANSFORM**

Q1. Find the Laplace Transform of the following functions

a). 𝑓 𝑥 = 1 − 𝑥 + 2𝑥 2

b). 𝑓 𝑥 = 4𝑒 −3𝑡 − 10sin 2

**CODE :**

clc

clear all

syms f1(t) f2(t) s a

f1(t)= 1-t+2\*(t^2);

f2(t)= 4\*exp(-3\*t)-10\*sin(2\*t);

fprintf('20BCD7160 Prathapani Satwika')

F1 = laplace(f1,t,s)

F2 = laplace(f2,t,s)

**OUTPUT :**

20BCD7160 Prathapani Satwika

F1 =

(s - 1)/s^2 + 4/s^3

F2 =

4/(s + 3) - 20/(s^2 + 4)

>>

Q2. Solve the ordinary differential equation 𝑦 ′′ + 2𝑦 ′ = 8𝑡, 𝑦 0 = 1, 𝑦 ′ 0 = 0, using Laplace transform.

**CODE :**

clc

clear all

syms t s Y y(t) Dy(t)

Df=diff(y(t),t,1);

DDf=diff(y(t),t,2);

Eqn=DDf+2\*Df==8\*t;

LEQN=laplace(Eqn,t,s);

LT\_Y=subs(LEQN,laplace(y,t,s),Y);

LT\_Y=subs(LT\_Y, y(0), 1);

LT\_Y=subs(LT\_Y, subs(diff(y(t), t), t, 0), 0);

ys=solve(LT\_Y,Y);

fprintf('20BCD7160 Prathapani Satwika');

y=ilaplace(ys,s,t)

**OUTPUT :**

20BCD7160 Prathapani Satwika

y =

2\*t^2 - exp(-2\*t) - 2\*t + 2

>>

Q3. Solve the equation y’’+ 16y = 16sin(2t) with the initial conditions that y(0) = 1, and y ‘ (0) = 0.

**CODE :**

clc

clear all

syms t s Y y(t) Dy(t)

Df=diff(y(t),t,1);

DDf=diff(y(t),t,2);

Eqn = DDf+16\*y==16\*sin(2\*t);

LEQN = laplace(Eqn,t,s);

LT\_Y =subs(LEQN,laplace(y,t,s),Y);

LT\_Y=subs(LT\_Y, y(0), 1);

LT\_Y=subs(LT\_Y, subs(diff(y(t), t), t, 0), 0);

ys=solve(LT\_Y,Y);

fprintf('20BCD7160 Prathapani Satwika \n');

y = ilaplace(ys,s,t)

**OUTPUT :**

20BCD7160 Prathapani Satwika

y =

cos(4\*t) + (4\*sin(2\*t))/3 - (2\*sin(4\*t))/3

>>