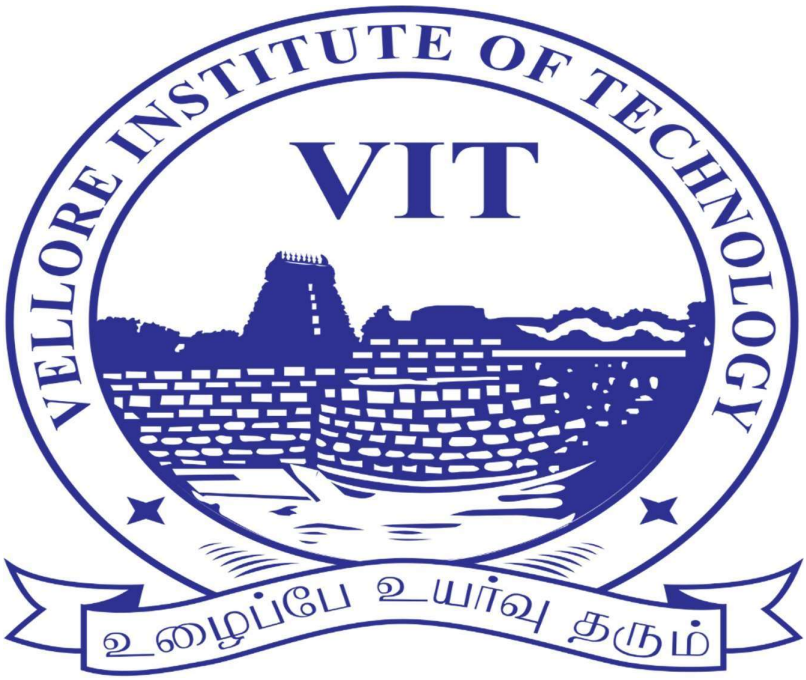

Application of Differential Equations

Lab – 4

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Q1)

Solve the following initial value problem using Laplace Transform

$$\frac{dy}{dt} + 2y = 12e^t, y(0) = 3$$

Code:

```
syms s t Y
a = input('The Coefficient of D2y = ');
b = input('The Coefficient of Dy = ');
c = input('The Coefficient of y = ');
nh = input('Enter the non homogenous part = ');
F = laplace(nh, t, s);
if (a==0)
d = input('The initial value of y at 0 is ');
Y1 = s*Y - d;
Sol = solve(b*Y1 + c*Y - F, Y);
else
d = input('The initial value of y at 0 is ');
e = input('The initial value of Dy at 0 is ');
Y1 = s*Y - d;
Y2 = s*Y1 - e;
Sol = solve(a*Y2+b*Y1 + c*Y - F, Y);
end
originalsol = ilaplace(Sol,s,t);
y = simplify(originalsol)
ezplot(y)
```

Input –

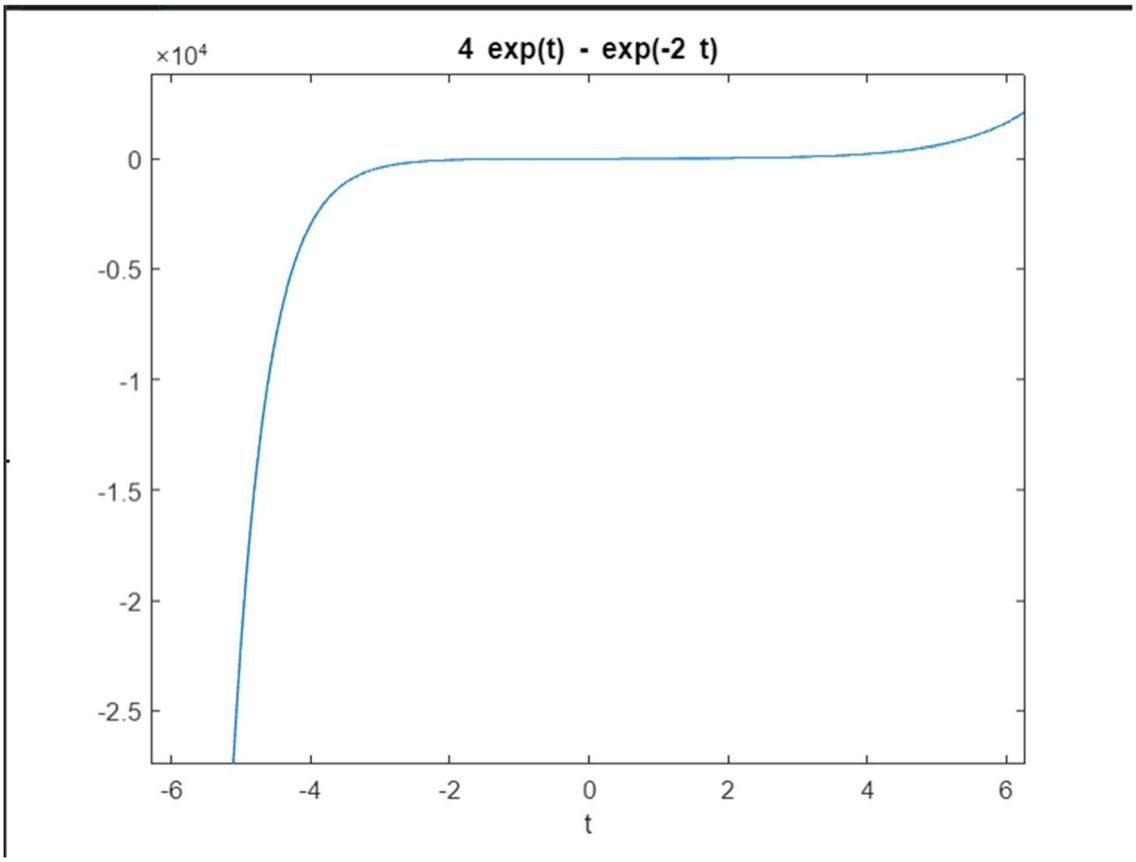
```
>> laplace1
The Coefficient of D2y =
0
The Coefficient of Dy =
1
The Coefficient of y =
2
Enter the non homogenous part =
12*exp(t)
The initial value of y at 0 is
3

y =

4*exp(t) - exp(-2*t)

>>
```

Plot –



Q2)

Solve the following initial value problem using Laplace Transform

$$\frac{d^2y}{dt^2} + 2y = 0, y(0) = 1, y'(0) = 1$$

Code-

```
clc
clear all
syms t s Y y(t)%%%%y=y(t) is the dependent variable given in the DE%%%%Y=Y(s) is the Laplace transform of y(t)
%y=sym('y(t)')
a = input('The Coefficient of D2y = ');
b = input('The Coefficient of Dy = ');
c = input('The Coefficient of y = ');
nh = input('Enter the non homogenous part = ');
%eqn=a*diff(sym('y(t)'),2)+b*diff(sym('y(t)'),1)+c*sym('y(t)')-nh
eqn=a*diff(y,2)+b*diff(y,1)+c*y-nh
LTY=laplace(eqn,t,s);
if (a==0)
d = input('The initial value of y at 0 is ');
LTY=subs(LTY,{laplace(y(t), t, s),y(0)},{Y,d});
else
d = input('The initial value of y at 0 is ');
e = input('The initial value of Dy at 0 is ');
LTY=subs(LTY,{laplace(y(t), t, s),y(0),subs(diff(y),t,0)},{Y,d,e}); %%%%Dy=diff(y, t),Dy(t),Dy(0)%%%%
end
eq=collect(LTY,Y); %%%%% Y*4+Y*x===collect=== Y*(4+x)
Y=simplify(solve(eq,Y));
y=simplify(ilaplace(Y,s,t))
ezplot(y)
```

Input-

```
The Coefficient of D2y =
1
The Coefficient of Dy =
0
The Coefficient of y =
2
Enter the non homogenous part =
0

eqn(t) =

2*y(t) + diff(y(t), t, t)

The initial value of y at 0 is
1
The initial value of Dy at 0 is
1

y =

cos(2^(1/2)*t) + (2^(1/2)*sin(2^(1/2)*t))/2

>>
```

Plot-