CSE 1002 PROGRAMS

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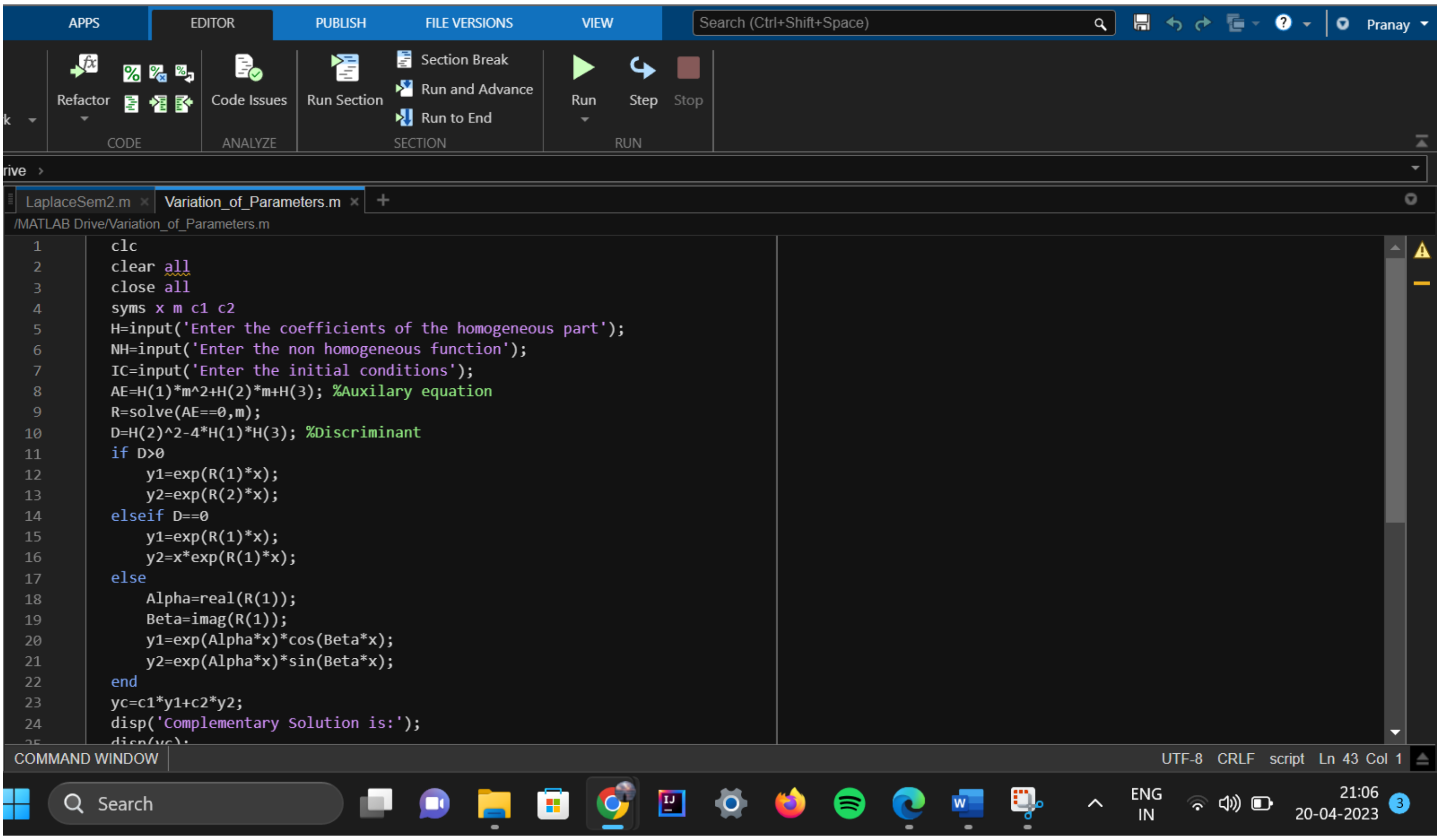
Experiment 3A:

Experiment:3A–Solution of linear differential equation by method of variation of parameters

Submit the e-record for the following.

1. Consider the problem of suspension cable $\frac{d^2y}{dx^2} = \frac{w(x)}{T_H}$ with the conditions $y(0) = 0$, $y'(0) = 0$, where $w(x) = x^2, T_H = 100$. Plot shape of the cable in the range $[-4, 8]$.

Code:



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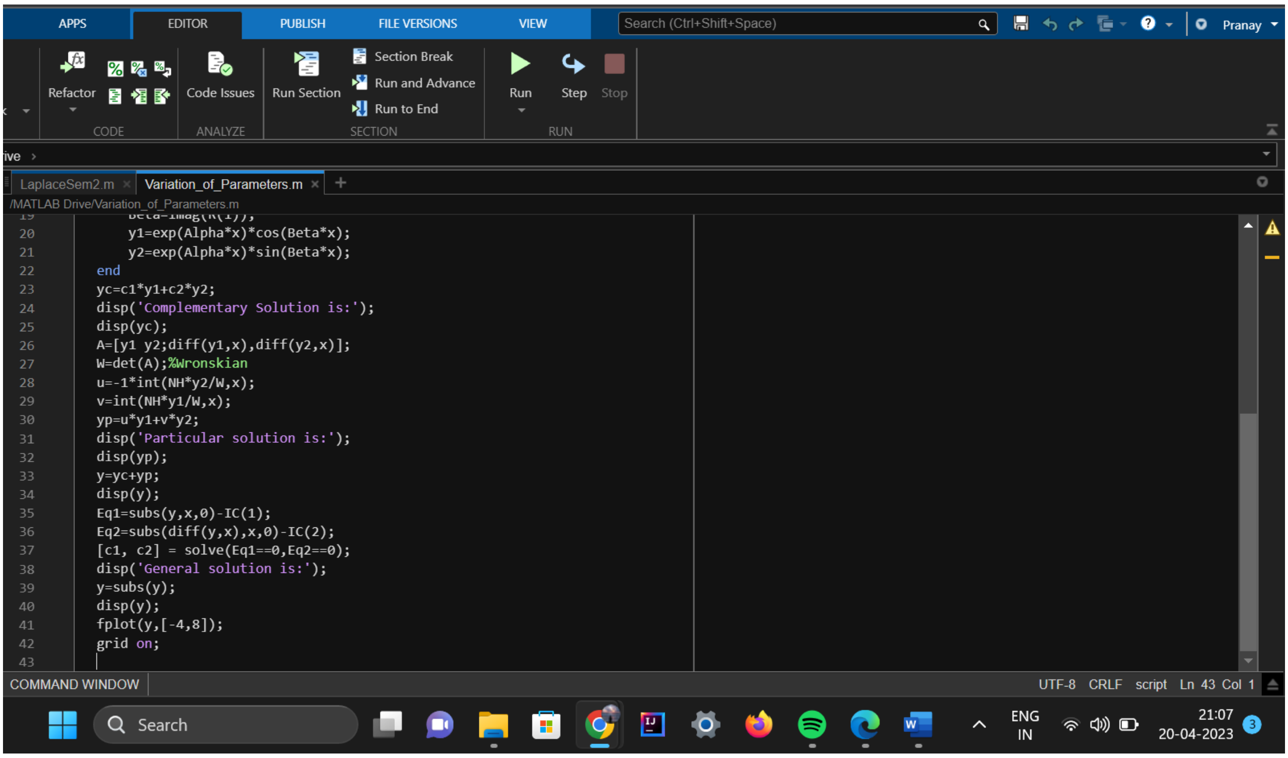
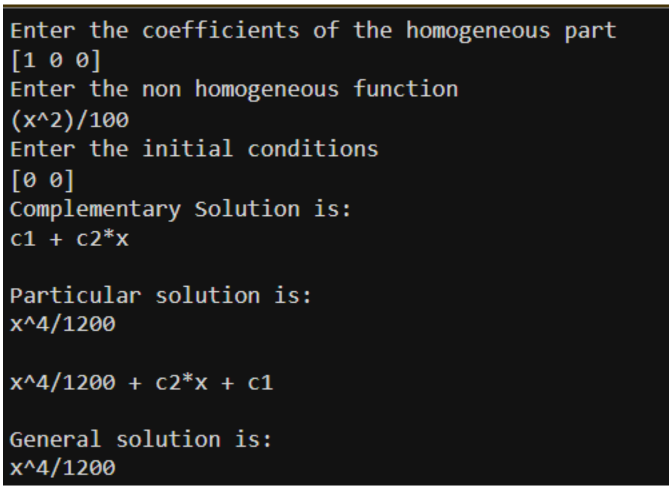


Output:



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Enter the coefficients of the homogeneous part
[1 0 0]
Enter the non homogeneous function
(x^2)/100
Enter the initial conditions
[0 0]
Complementary Solution is:
c1 + c2*x

Particular solution is:
x^4/1200

x^4/1200 + c2*x + c1

General solution is:
x^4/1200
```

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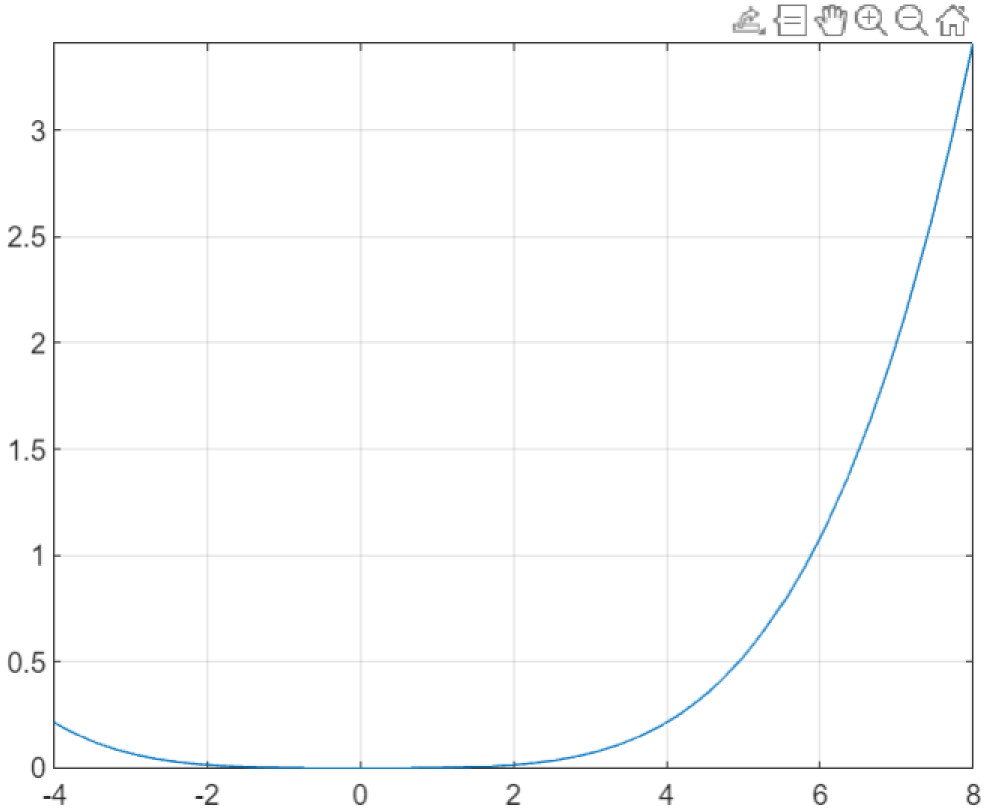
Function Plot:



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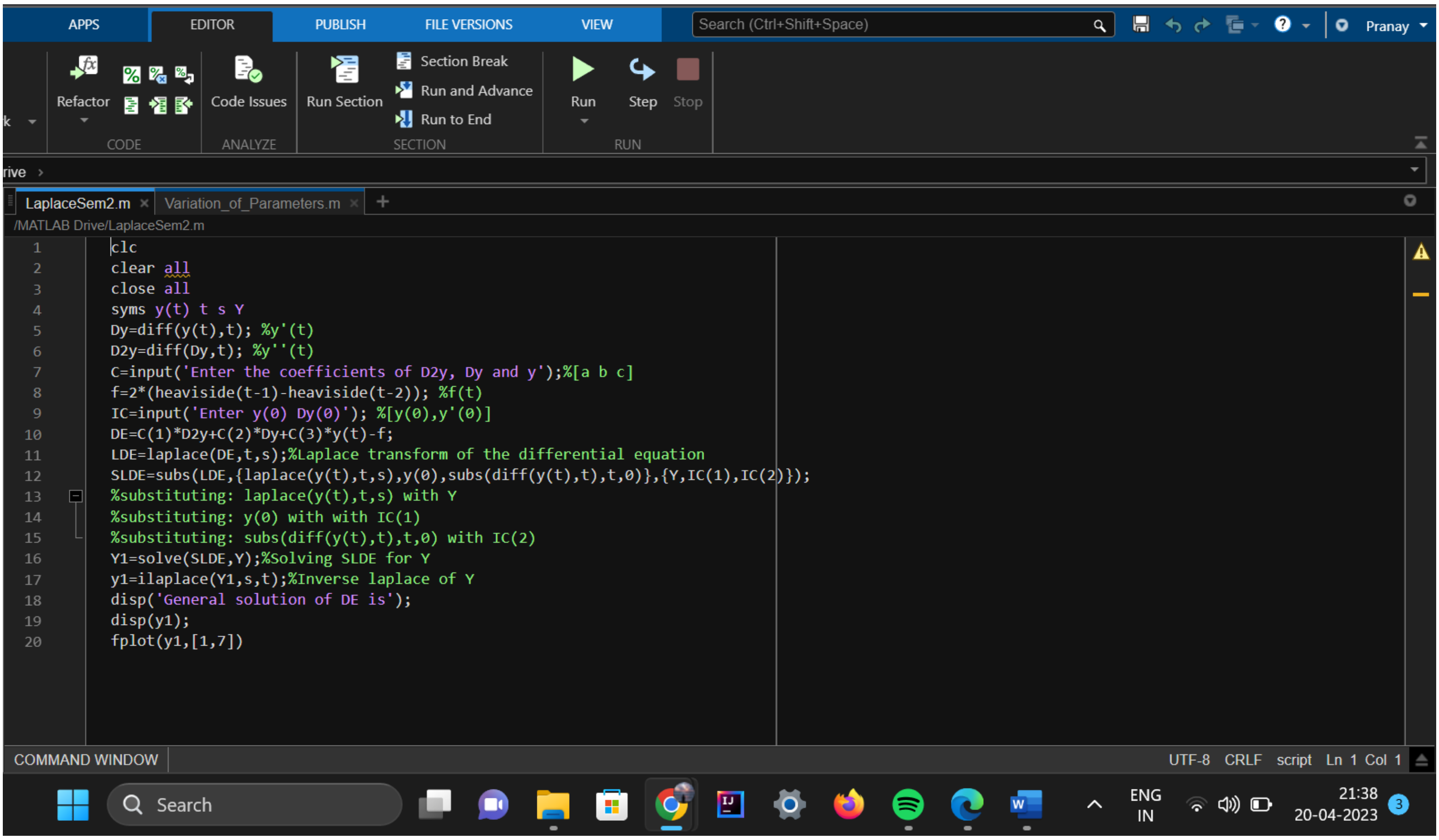
Experiment 3B:

Experiment:3B–Solution of linear differential equation by Laplace Transforms

1. Determine the response of the damped mass- spring system under a square wave, modeled by $y'' + 3y' + 2y = r(t)$, where $r(t) = \begin{cases} 0, & 0 < t < 1 \\ 2, & 1 < t < 2 \\ 0, & t \geq 2 \end{cases}$. Subject to the initial conditions $y(0) = y'(0) = 0$. Plot the solution.

Code:



```
clc
clear all
close all
syms y(t) t s Y
Dy=diff(y(t),t); %y'(t)
D2y=diff(Dy,t); %y''(t)
C=input('Enter the coefficients of D2y, Dy and y');%[a b c]
f=2*(heaviside(t-1)-heaviside(t-2)); %f(t)
IC=input('Enter y(0) Dy(0)'); %[y(0),y'(0)]
DE=C(1)*D2y+C(2)*Dy+C(3)*y(t)-f;
LDE=laplace(DE,t,s);%Laplace transform of the differential equation
SLDE=subs(LDE,{laplace(y(t),t,s),y(0),subs(diff(y(t),t),t,0)},{Y,IC(1),IC(2)});
%substituting: laplace(y(t),t,s) with Y
%substituting: y(0) with with IC(1)
%substituting: subs(diff(y(t),t),t,0) with IC(2)
Y1=solve(SLDE,Y);%Solving SLDE for Y
y1=ilaplace(Y1,s,t);%Inverse laplace of Y
disp('General solution of DE is');
disp(y1);
fplot(y1,[1,7])
```

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Output:

```
Enter the coefficients of D2y, Dy and y
[1 3 2]
Enter y(0) Dy(0)
[0 0]
General solution of DE is
2*heaviside(t - 1)*(exp(2 - 2*t)/2 - exp(1 - t) + 1/2) - 2*heaviside(t - 2)*(exp(4 - 2*t)/2 - exp(2 - t) + 1/2)
```

Function Plot: