

MAT 1011 - LAB FAT EXAMS (MATLAB)

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SUBJECT - MAT 1011 ELA (LAB)

ROLL: 20BCT0332

TIME: 11:30 am - 1:00 pm

DAY & DATE: Monday, 1st February, 2021

CLASS NO: VL2020210108470

SET - 2 (20BCT0332)

1) a) MATLAB CODE to find Laplace of $e^{-t} + \cos t$

A: i) Aim: To find the Laplace transform of a user defined function (here in terms of t) using MATLAB.

ii) SYNTAX:

Commands	Description
1) $x = \text{input(' ')};$	Displays the text in prompt, waits for user to input value / function / variables followed by the enter 'key'. Stores aforementioned value / function / variables in x (here).
2) $\text{laplace}(t);$	Finds Laplace transform of function. (here stored in variable 'f'). Default value for input is in terms of 't', & default return type value is in terms of 's'. This can be changed by using $\text{laplace}(x, u, v);$ where u represents input variable terms and outputs a value in terms of v (as in example)
3) $\text{disp}(F);$ $\text{disp('...')};$	Shows information about an immediate result, such as values, size types, variable names, variable data, text, etc.

iii) Program :

iii) Program :

clear all

clc

syms t

f = input('Enter the function in terms of t: ');

F = laplace(f);

disp('Laplace Transform of $f(t) =$ ');

disp(F);

iv) Output :

Enter the function in terms of t:

$\exp(-t) * t * \cos(5*t)$

Laplace transform of $f(t) =$

$((2*s + 2) * (s+1)) / ((s+1)^2 + 25)^2 - 1 / ((s+1)^2 + 25)$

(Output Screenshot in next page:)

X

1st Shifting Theory :

- If $L\{f(t)\} = F(s)$, then $L\{e^{at} f(t)\} = F(s-a)$
- If $L\{f(t)\} = F(s)$, then $L\{e^{-at} f(t)\} = F(s+a)$

Write a MATLAB Program to execute the first shifting theorem, verify with an example.

- P.T.O —→ Last Page -

1) b) MATLAB CODE to find the inverse Laplace transform

of $F(s) = \frac{1}{s^3(s-1)^2(s^2+4)}$

i) Aim: To find the Inverse Laplace Transform of a user defined function (here, in terms of s) using MATLAB.

ii) SYNTAX:

Commands	Description
1) $F = \text{input}('...');$	Displays the text in prompt, waits for user to input value / function / variables followed by the 'enter' key. Stores the aforementioned value / function / variables (here) in F .
2) $\text{ilaplace}(F);$	Finds the inverse Laplace Transform of a function (here stored in variable ' F '). Default value for input is in terms of ' s ', & default return type value is in terms of ' t '. This can be changed by using $\text{ilaplace}(F, u, v);$ where u represent input variable, and v represents output variable.
3) $\text{disp}(t);$ $\text{disp}('...');$	Shows information about an immediate result, such as values, size types, variable name names, variable data, text, etc

iii) Program:

— P.T.O —

iii) Program :

clear all

clc

syms s

F = input('Enter the function in terms of s: ');

f = ilaplace(F);

disp('Inverse laplace Transform of F(s) = ');

disp(f);

iv) Output :

Enter the function in terms of s:

$\frac{1}{((s^3) * ((s-1)^2) * ((s^2) + 4))}$

Inverse laplace transform of F(s) =

$$\frac{t}{2} - \frac{(3 * \cos(2*t))}{400} - \frac{\sin(2*t)}{100} - \frac{(17 * \exp(t))}{25} + \frac{(t * \exp(t))}{5} + \frac{t^2}{8} + \frac{11}{16}$$

(Output Screenshot in next page :)

2) MATLAB CODE to draw the surface $x = \cos(t)$, $y = \sin(t)$, $z = \sin(3t)$ using the `plot3()` command.

i) Aim: To plot the surface defined by the three curves $x = \cos t$, $y = \sin t$, $z = \sin 3t$ using the `plot3()` command in MATLAB.

ii) SYNTAX:

Commands	Description
1) <code>t = linspace (start, end, step);</code>	Creates a 2D/3D Vector with a defined length for successive intervals. It takes in a start, end & step function.
2) <code>comet3(x, y, z);</code>	Displays a comet graph of the curve through the points $x(i)$, $y(i)$ & $z(i)$
3) <code>plot3(x, y, z);</code>	Displays a 3D plot of a set of data points (here defined as x , y and z ; corresponding to the 3 axes in a 3D graph).
4) <code>xlabel()</code> , <code>ylabel()</code> and <code>zlabel()</code> ;	Modifies the label appearance for the x , y and z axis respectively.
5) <code>title('');</code>	Displays title card for obtained figure

iii) Program :

```
clear all
```

```
clc
```

```
t = linspace (0, 2 * pi, 500);
```

```
x = cos(t);
```

```
y = sin(t);
```

```
z = sin(3*t);
```



```
comet3(x,y,z);  
plot3(x,y,z);  
xlabel('x-axis');  
ylabel('y-axis');  
zlabel('z-axis');  
title('3D - Curve');
```

iv) Output : Screenshot in the next page :

X

3) Viva Question → Verification of 1st Shifting Theorem

Aim: to verify 1st Shifting Theorem using MATLAB

Screenshot : P.T.O

Syntax → Same. as Exp 1(a) & 1(b)

X

Q 1A)

The MATLAB Editor interface shows a script in the Editor pane with the following code:

```
1 - clear all
2 - clc
3 - syms t
4 - F=input('Enter the function in terms of t: ');
5 - F=laplace(F);
6 - disp('Laplace transform of f(t) = ');
7 - disp(F);
8
```

The Workspace pane shows the following variables:

Name	Value	Size	Class
F	1×1 sym	1×1	sym
f	1×1 sym	1×1	sym
t	1×1 sym	1×1	sym

The Command Window shows the output:

```
New to MATLAB? See resources for Getting Started.
Enter the function in terms of t:
exp(-t)*t*cos(5*t)
Laplace transform of f(t) =
((2*s + 2)*(s + 1))/((s + 1)^2 + 25)^2 - 1/((s + 1)^2 + 25)
>> |
```

Q 1B)

The MATLAB Editor interface shows a script in the Editor pane with the following code:

```
1 - clear all
2 - clc
3 - syms s
4 - F=input('Enter the function in terms of s: ');
5 - f=ilaplace(F);
6 - disp('Inverse Laplace transform of F(t) = ');
7 - disp(f);
8
```

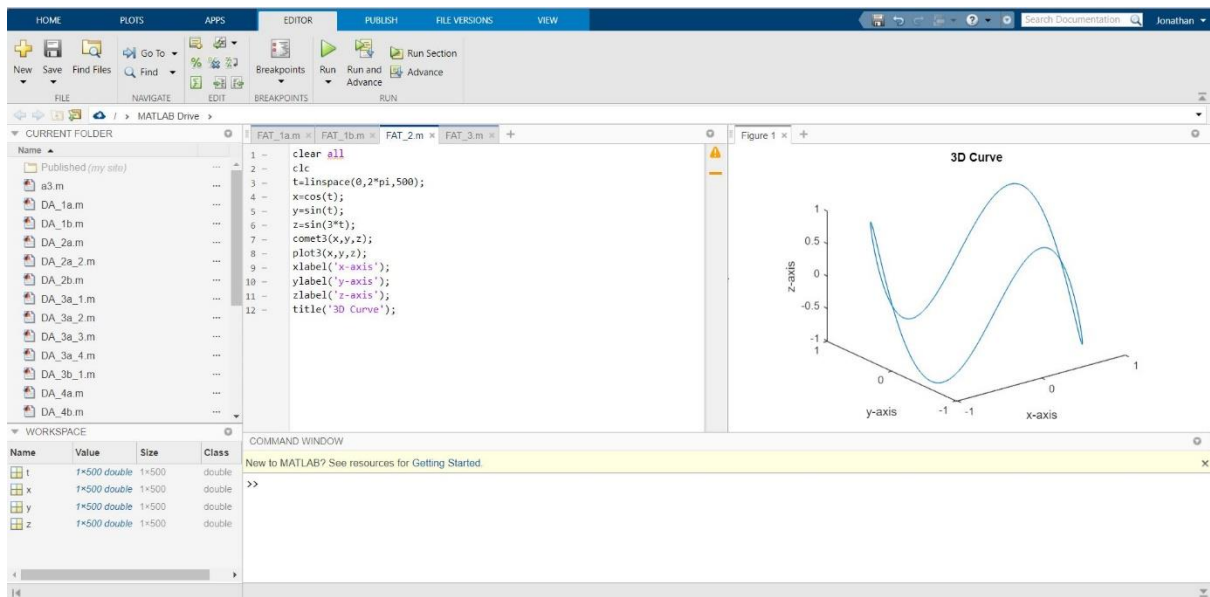
The Workspace pane shows the following variables:

Name	Value	Size	Class
F	1×1 sym	1×1	sym
f	1×1 sym	1×1	sym
s	1×1 sym	1×1	sym

The Command Window shows the output:

```
New to MATLAB? See resources for Getting Started.
Enter the function in terms of s:
1/((s^3)*((s-1)^2)*((s^2)+4))
Inverse Laplace transform of F(t) =
t/2 - (3*cos(2*t))/400 - sin(2*t)/100 - (17*exp(t))/25 + (t*exp(t))/5 + t^2/8 + 11/16
>> |
```

Q2)



Q3 Viva)

