ECHEBEGOR EFE CHRISTIAN
18/ENG05/014
MECHATRONICS ENGINEERING
ENG282 (Engineering Mathematics)

1.) Accumulation Rate = Input rate of salt - Output rate of salt

$$dy/dt = y_{in} - y_{out}$$

Since 5ogal of brine enters the tank per minute and one gallon contains $(1 + \sin t)$lb of salt;

at $t = 1$,

$$(1 + \sin t) = (1 + \sin(1)) = 1.02\text{lb of salt};$$

$$y_{in} = 5\text{ogal/min} \times 1.02\text{lb/gal} = 51\text{lb/min}$$

$\frac{30\text{gal}}{1200\text{gal}} = 0.025 = 2.5\%$ of the content of the tank, that being the case, 2.5% of the salt present in the tank will also leave the tank per minute, i.e $y_{out} = 2.5$ of y.

a.) dy/dt (lb/min) = 51 (lb/min) − 2.5% of y (lb/min)

b.) $dy/dt = 51 - 0.025y$; $dy/dt = -0.025y + 51$;

$$dy/dt = -0.025\left[-0.025y + 51 \; ; \; -0.025y - 0.025\right]; \quad \frac{dy}{dt} = -0.025(y - 2040);$$

$$\frac{dy}{(y - 2040)} = -0.025\,dt; \quad \int \frac{dy}{(y-2040)} = \int -0.025\,dt$$

$$\int \frac{dy}{(y-2040)} = -0.025 \int dt \; ; \; \ln(y - 2040) = -0.025t + C;$$

$$y - 2040 = e^{-0.025t + C}; \quad y - 2040 = e^{-0.025t}\,e^{C};$$

$$y - 2040 = e^{-0.025}\,y_0; \quad y - 2040 = y_0 e^{-0.025t};$$

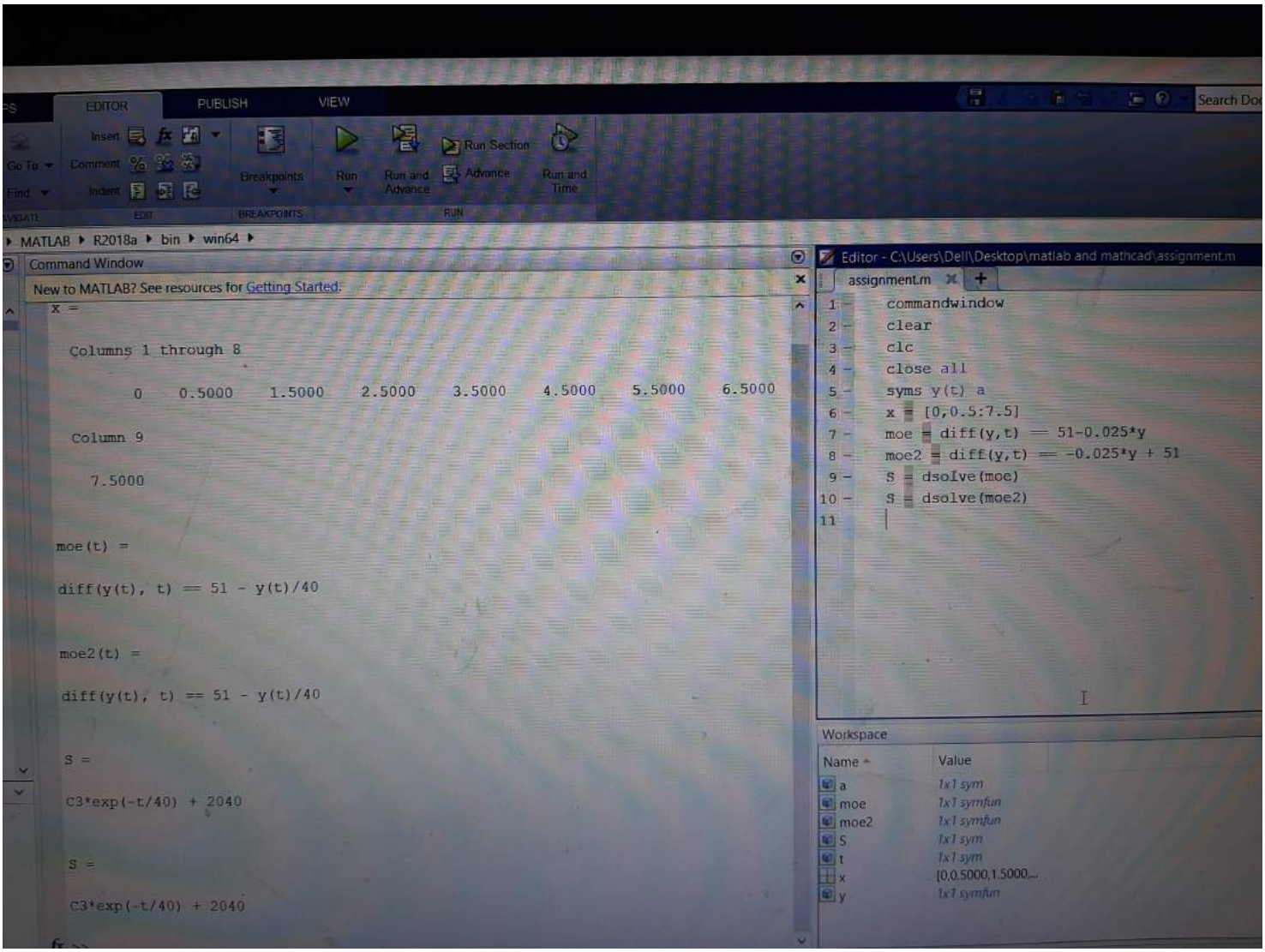
$$y = y_0 e^{-0.025t} + 2040;$$ Given that when $t = 0$min (initially),

$$y = 150\text{lb};$$

$150 = y_0 e^{-0.025(0)} + 2040$; $150 - 2040 = y_0 \times 1$; $y = -1890$

$y_1 = -1890 e^{-0.025t} + 2040$

$y_2 = 2040 - 1890 e^{-0.025t}$


EDITOR
PUBLISH
VIEW
Insert
Comment
Indent
Go To
Find
Breakpoints
Run
Run and Advance
Run Section
Advance
Run and Time
MATLAB ▸ R2018a ▸ bin ▸ win64 ▸
Command Window
New to MATLAB? See resources for Getting Started.
x =
Columns 1 through 8
0 0.5000 1.5000 2.5000 3.5000 4.5000 5.5000 6.5000
Column 9
7.5000
moe(t) =
diff(y(t), t) == 51 - y(t)/40
moe2(t) =
diff(y(t), t) == 51 - y(t)/40
S =
C3*exp(-t/40) + 2040
S =
C3*exp(-t/40) + 2040
Editor - C:\Users\Dell\Desktop\matlab and mathcad\assignment.m
assignment.m
1 commandwindow
2 clear
3 clc
4 close all
5 syms y(t) a
6 x = [0,0.5:7.5]
7 moe = diff(y,t) == 51-0.025*y
8 moe2 = diff(y,t) == -0.025*y + 51
9 S = dsolve(moe)
10 S = dsolve(moe2)
11
Workspace
Name
Value
a 1x1 sym
moe 1x1 symfun
moe2 1x1 symfun
S 1x1 sym
t 1x1 sym
x [0,0.5000,1.5000,...
y 1x1 symfun

Editor - C:\Users\Dell\Desktop\matlab and mathcad\assignment.m*

assignment.m*

```
1 -  commandwindow
2 -  clear
3 -  clc
4 -  close all
5 -  syms t
6 -  y = (50/0.05)+((50/1.0025)*sin(t))+(((50*(0.05))/1.0025)*cos
7 -  ym = 1000-(800*exp(-0.05*t))
8 -  oddValues = 1:2:500
9 -  evenValues = 2:2:500
10 -  ym = double(subs(y, oddValues))
11 -  ymm = double (subs(ym, evenValues))
12 -  totTime = 1:1:500
13 -  timeTrans = totTime'
14 -  c = reshape([ym,ymm],[],1)
15 -  combVal = double(c)
16 -  plot(totTime, c)
17 -  grid on
18 -  grid minor
19 -  xlabel('T(min)'), ylabel('V(litre)')
20 -  col_header = {'t(min)', 'V(Litre)'}
21 -  xlswrite['odevbesdata.xlsx',col_header,'veriler','A2']
22 -  xlswrite['odevbesdata.xlsx',timeT,'veriler','A3']
23 -  xlswrite['odevbesdata.xlsx',combined,'veriler','B2']
```

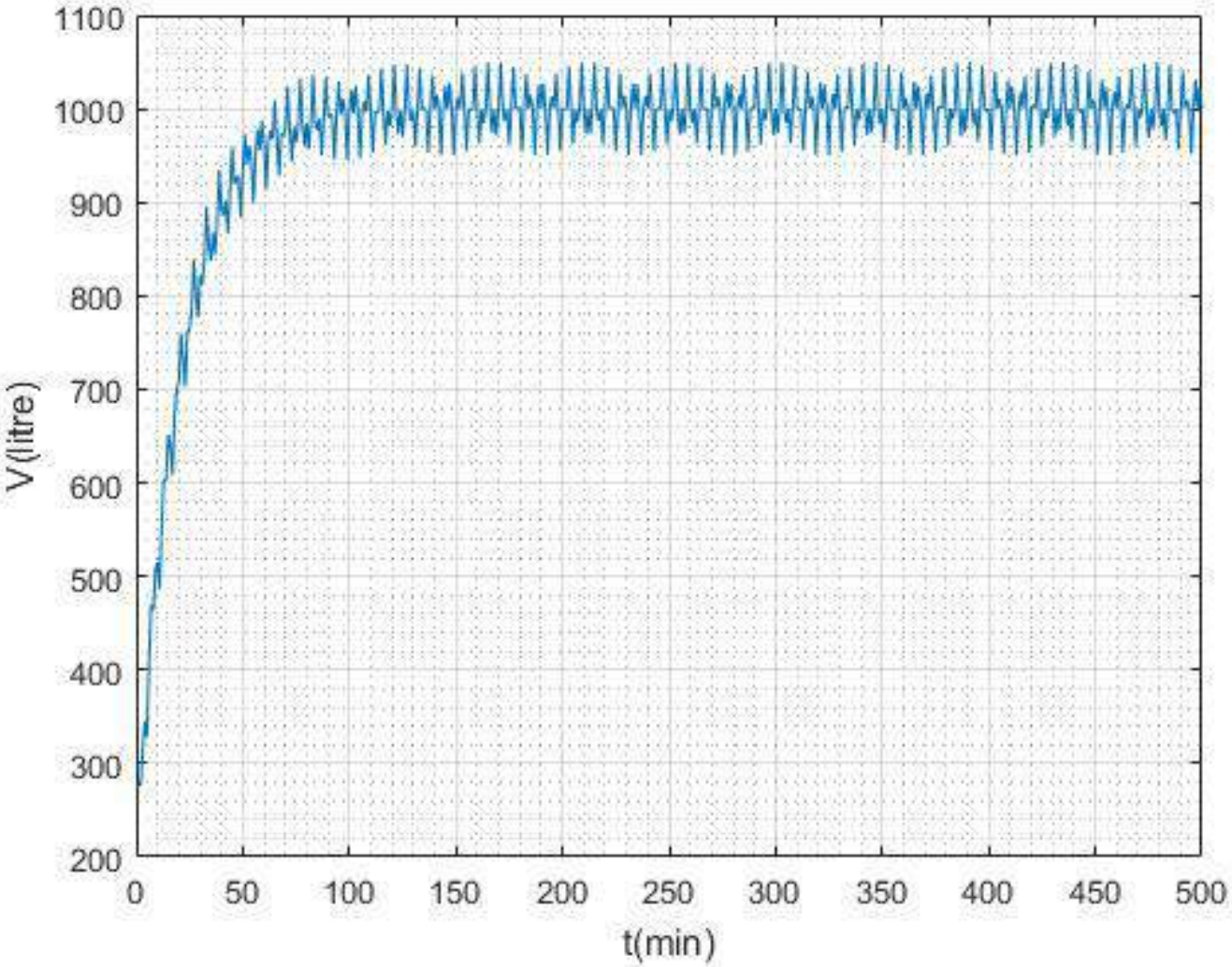
Workspace

Name	Value
c	62750x1 double
combVal	62750x1 double

script

Ln 23 Col 53

6:52 PM
5/6/2020


1100
1000
900
800
700
600
500
400
300
200
V(litre)
0
50
100
150
200
250
300
350
400
450
500
t(min)