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Matric NO: 18/ENG02/022

Department: Computer Engineering

1200 gallon of water and 150lb of salt
= Initial aggregation

50 gallons of brine (Salt and water) \rightarrow Inlet
(1 + sint) lb

30 gallon comes out per minute
Using balance law

$$= \left(\text{Accumulation rate of Salt with a system} \right) = \left(\text{Intake rate of Salt into the system} \right) - \left(\text{Output rate of Salt within the system} \right)$$

$$\therefore \text{Therefore } \frac{dm}{dt} = M_{in} - M_{out}$$

$$M_{in} = \frac{50 \text{ gallons}}{\text{minute}} \left(1 + \sin t \right) \frac{\text{lb}}{\text{gal}} = 50(1 + \sin t) \frac{\text{lb}}{\text{min}}$$

$$M_{out} = \frac{30 \text{ gallon}}{1200 \text{ gal}} = 0.025 = 2.5\% \text{ of } m$$

$$\frac{dm}{dt} \frac{\text{lb}}{\text{min}} = 50(1 + \sin t) \frac{\text{lb}}{\text{min}} - 2.5\% \text{ of } m \frac{\text{lb}}{\text{min}}$$

$$\frac{dm}{dt} = 50(1 + \sin t) - 0.025m$$

Collecting $-0.025m$ from the equation

$$\begin{aligned} & \therefore -0.025m + 50(1 + \sin t) \\ & = -0.025 \left(\frac{-0.025m + 50(1 + \sin t)}{-0.025} \cdot \frac{0.025}{0.025} \right) \end{aligned}$$

$$\therefore \frac{dm}{dt} = -0.025(m - 2000(1 + \sin t))$$

~~dm~~ Cross multiply

$$\therefore dm = -0.025(m - 2000(1 + \sin t)) dt$$

Then divide it by $(m - 2000(1 + \sin t))$

$$\frac{dm}{m - 2000(1 + \sin t)} = -0.025 dt$$

$$\int \frac{dm}{m - 2000(1 + \sin t)} = \int -0.025 dt$$

$$= -0.025 \int dt$$

$$\ln |m - 2000(1 + \sin t)|$$

$$\ln |m - 2000(1 + \sin t)| = -0.025t + C$$

$$m - 2000(1 + \sin t) = e^{-0.025t + C}$$

$$m - 2000(1 + \sin t) = e^{-0.025t} + e^C$$

$$m - 2000(1 + \sin t) = M_0 e^{-0.025t}$$

$$m = M_0 e^{-0.025t} + 2000(1 + \sin t)$$

It was given that $t = 0$ mins initially:

therefore $m = 150$ lb.

$$150 = M_0 e^{-0.025 \cdot 0} + 2000(1 + \sin(0))$$

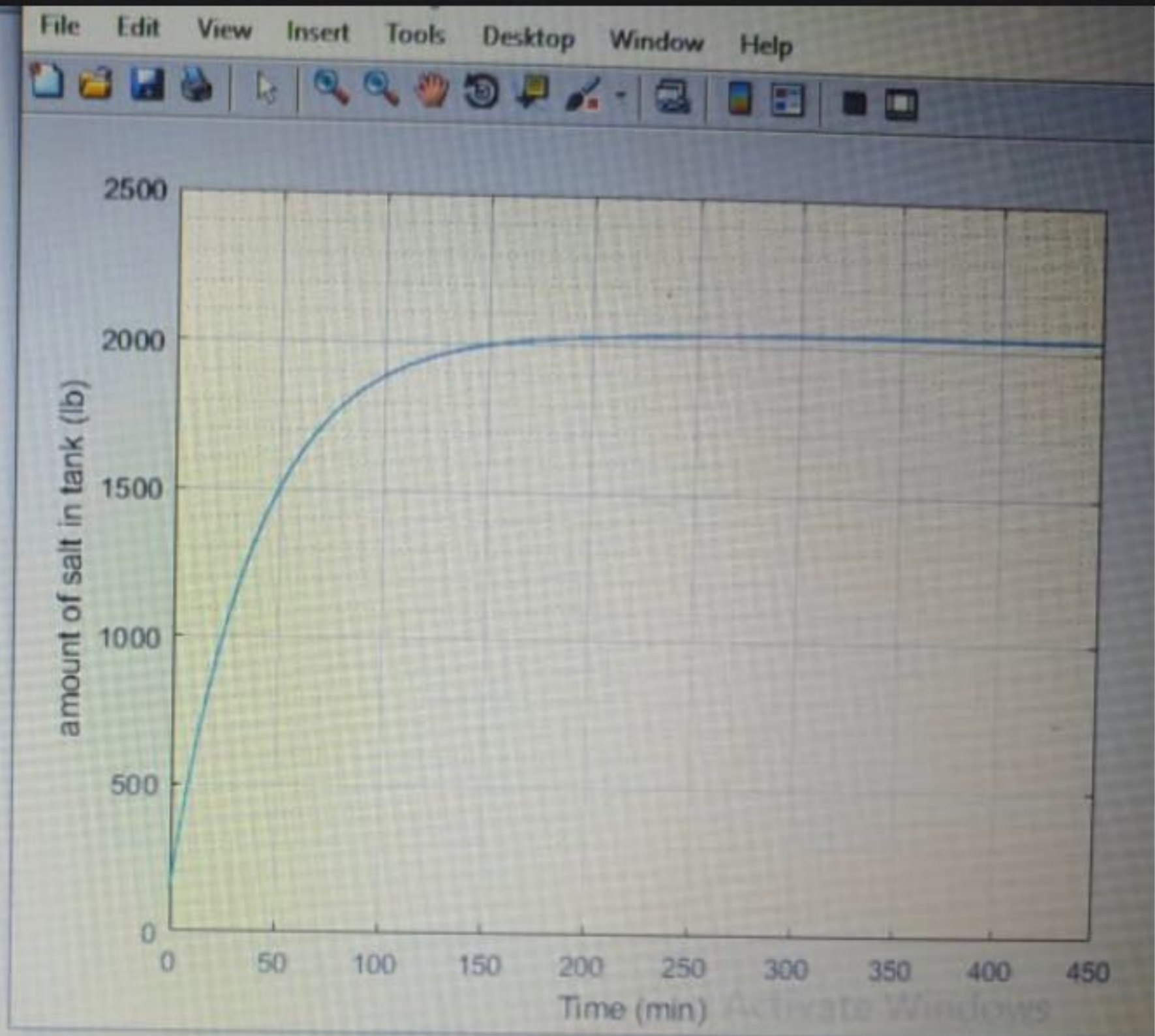
$$150 = M_0 e^{-0.025 \cdot 0} + 2000(1 + \sin(0))$$

$$-M_0 = 2000 - 150$$

$$-M_0 = 1850 \text{ divide both sides by } (-1)$$

$$= M_0 = 1850$$

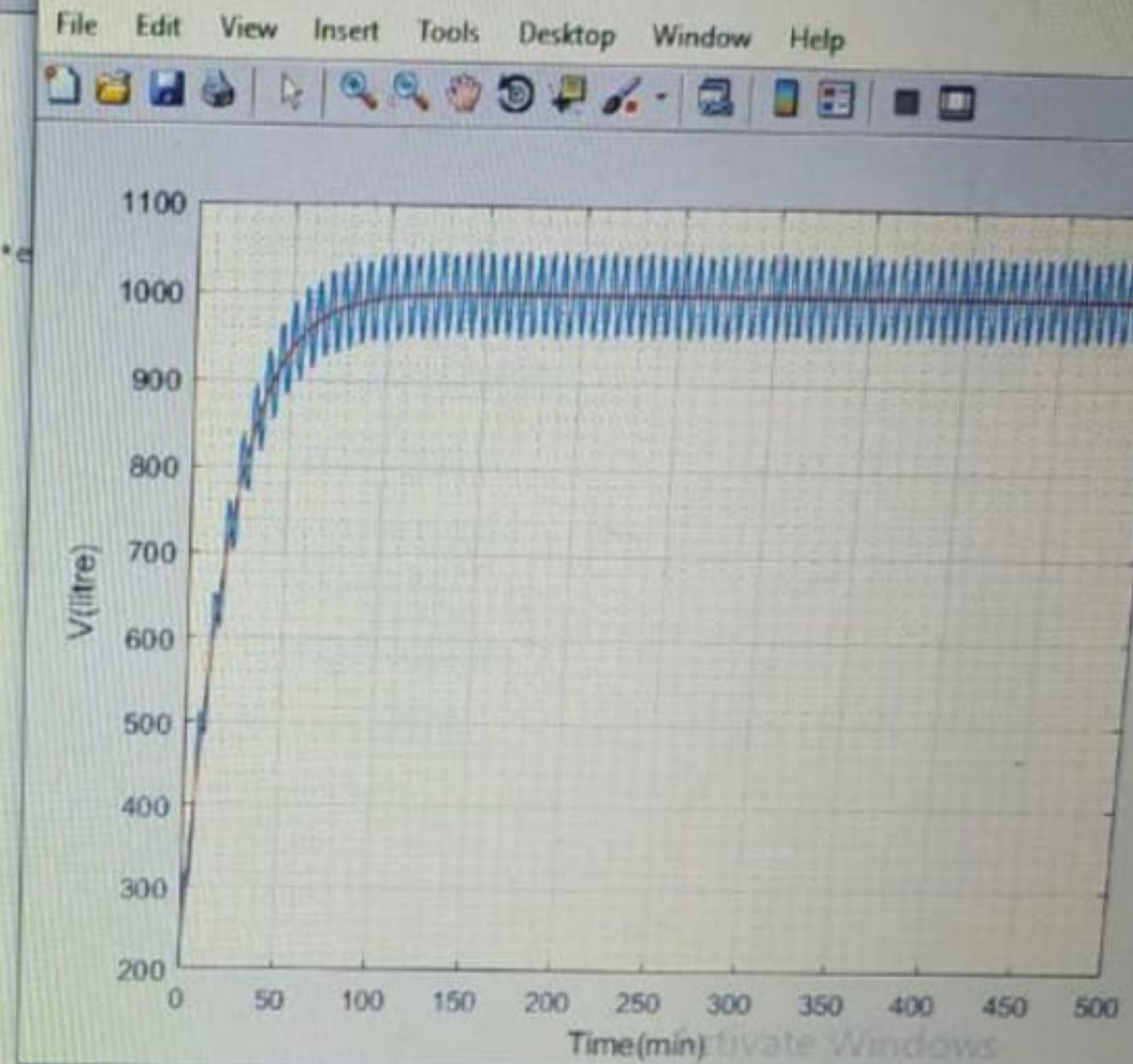
```
commandwindow
clearvars
clc
close all
t = 0:0.5:450;
m = 2040 - 1890*exp(-0.025*t);
plot(t,m)
xlabel('Time (min)')
ylabel('amount of salt in tank (lb)')
grid on
grid minor
```



```

commandwindow
clearvars
clc
close all
t = 0:1:500;
y= (50/0.05)+(50*sin(t)/1.0025)+(50*0.05*cos(t)/1.0025)-802.49*e
plot(t,y)
hold on
tm = 1:1:500;
ym= 1000 - 800*exp(-0.05*tm);
plot(tm,ym)
hold off
xlabel('Time(min)')
ylabel('V(litre)')
grid on
grid minor
xlswrite('odevbesdata.xlsx',[t(:),y(:)],'veriler','A2')
xlswrite('odevbesdata.xlsx',[tm(:),ym(:)],'veriler','A2')

```



	A	B	C	D	E	F	G	H	I
2	1	239.0165							
3	2	276.1301							
4	3	311.4336							
5	4	345.0154							
6	5	376.9594							
7	6	407.3454							
8	7	436.2495							
9	8	463.744							
10	9	489.8975							
11	10	514.7755							
12	11	538.4402							
13	12	560.9507							
14	13	582.3634							
15	14	602.7318							
16	15	622.1068							
17	16	640.5368							
18	17	658.0681							
19	18	674.7443							
20	19	690.6072							
21	20	705.6964							
22	21	720.0498							

Sheet1 veriler

Windows taskbar with search bar and icons for Mail, Edge, File Explorer, and Settings.