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MECHATRONICS ENCY.
TUESDAY, MAY 5TH.

① Balance Law Shows:

Accumulated rate of salt within a system =

Intake rate of salt into the system - Output rate of salt within the system

where;

1200 gal of water = Initial aggregation
150 lb of salt

30 gal of salt and water (brims) and $C(1+\sin t)$ gal = inlet

30 gal per minute - outlet

$$\therefore \frac{dm}{dt} = m_{in} - m_{out}$$

$$m_{in} = \frac{30 \text{ gal}}{\text{min}} \times \frac{C(1+\sin t) \text{ lb}}{\text{gal}} = 30 C(1+\sin t) \frac{\text{lb}}{\text{min}}$$

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

$$\frac{dm}{dt} \times \frac{\text{lb}}{\text{min}} = 30 C(1+\sin t) \frac{\text{lb}}{\text{min}} - 2.5\% \text{ of } m \frac{\text{lb}}{\text{min}}$$

$$\frac{dm}{dt} = 30 C(1+\sin t) - 0.025m$$

Collecting - 0.025 from the equation

Therefore $-0.025 + 50(1 + \sin t)$

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

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

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

$$\therefore dm = -0.025 dt$$

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

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

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

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

$$m - 2000(1 + \sin t) = m_0 e^{-0.025t} +$$

$$m = m_0 e^{-0.025t} + 2000(1 + \sin t)$$

$t = 0 \text{ mins}$; therefore $m = 1500 \text{ lb}$

$$1500 = m_0 e^{-0.025 \times 0} + 2000(1 + \sin(0))$$

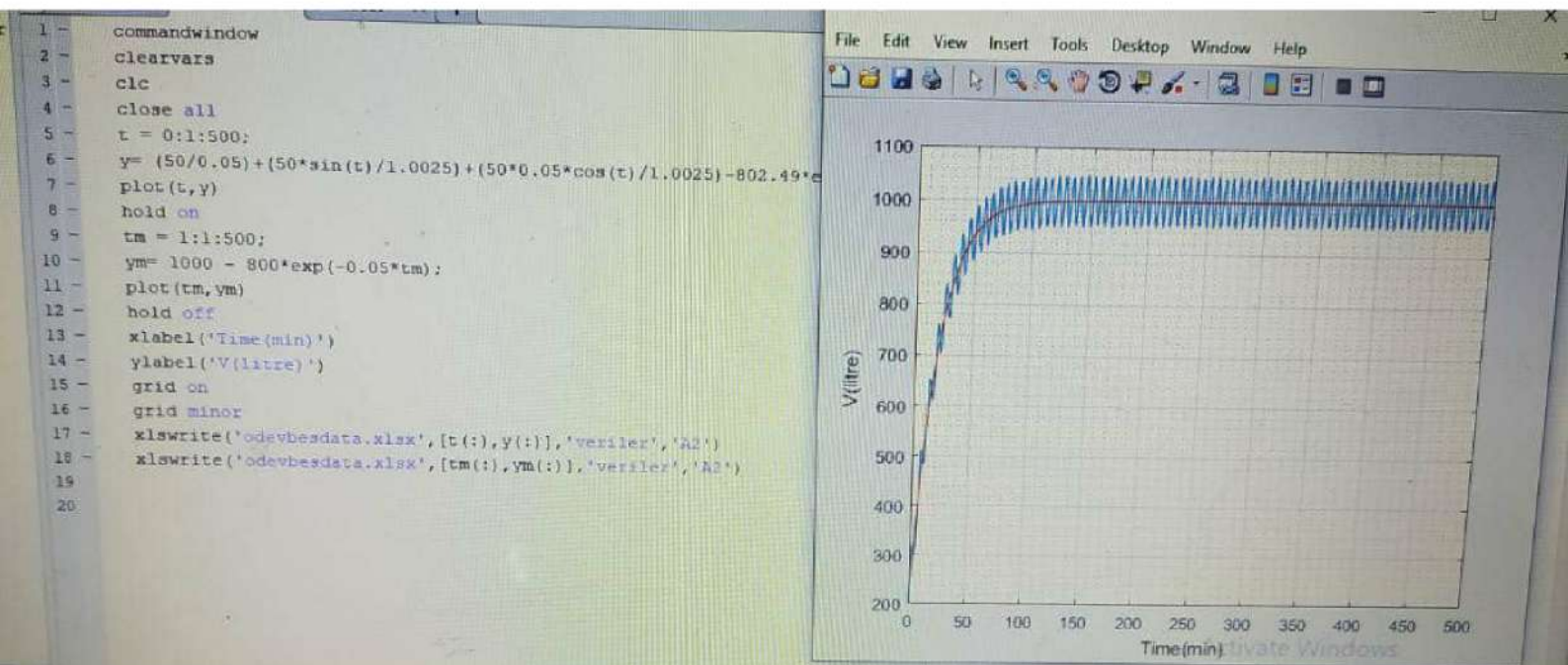
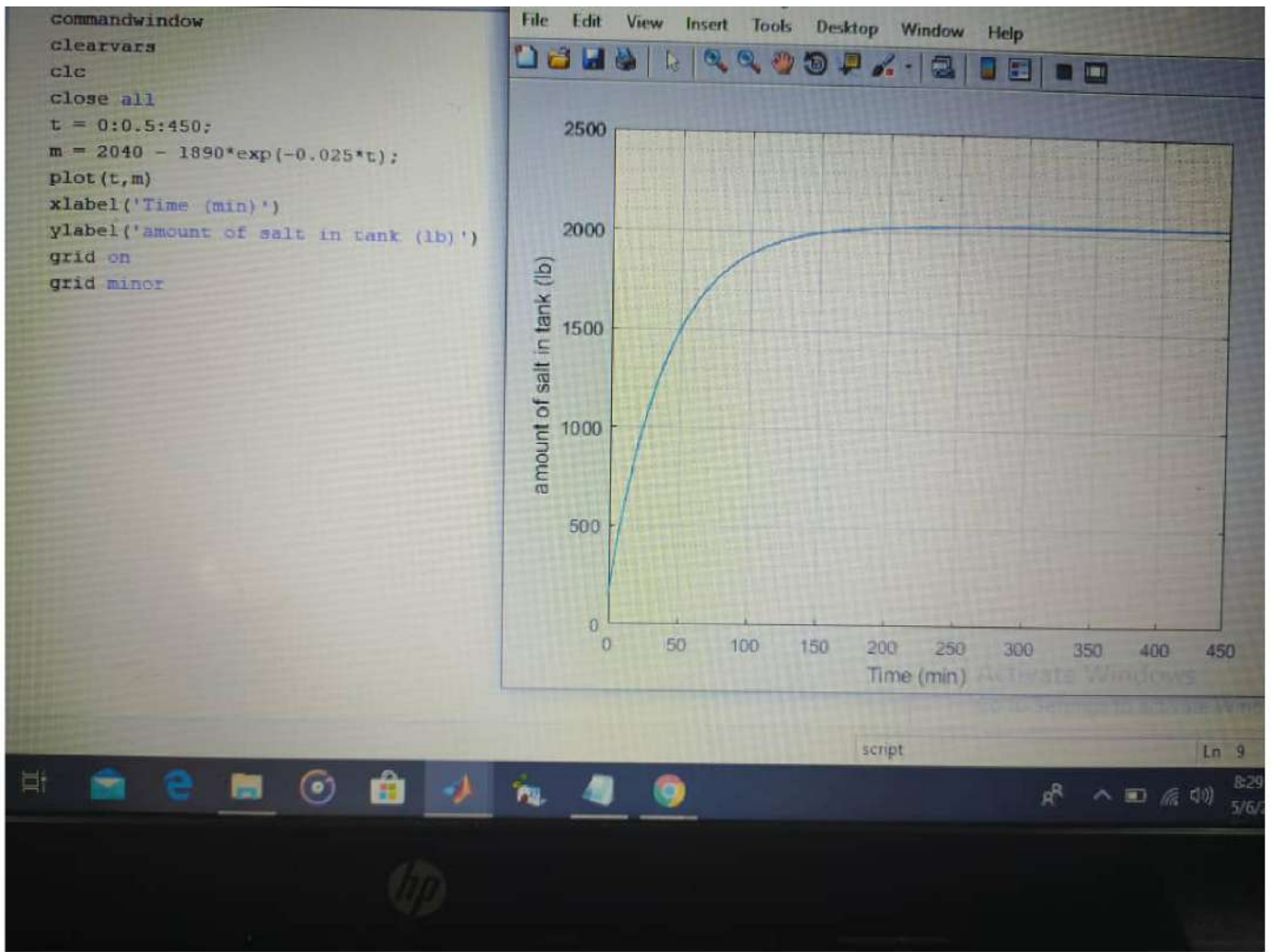
$$1500 = m_0 e^{-0.025 \times 0} + 2000(1 + \sin(0))$$

$$-m_0 = 2000 - 1500$$

$$-m_0 = 1850$$

$$\frac{-1}{-1} \quad \frac{-1}{-1}$$

$$= m_0 = -1850$$



	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 other applications.

