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CIVIL ENGINEERING
18/ENG03/002
ENG 282 <ENGINEERING MATHS>

(1) If we are to Apply the balance law:
The Accumulation rate = Input rate of Salt − Output rate of Salt
Where; The Accumulation rate is the Salt within a system
The Input rate is given as the salt into the System
The Output rate is given as the Salt from the System
Denoting; the amount of salt present in the tank at any given time <t> is y; and its time rate of change is given as;

$$\frac{dy}{dt} = y_{in} - y_{out}$$

∴ Having 50 gallon of brine entering the tank per minute an 1 gallon contains <1 + sin t> lb of salt;

i, t = 1; <1 + sin t> = <1 + sin C> = 1.0216 lb of salt:

$$\therefore 50\frac{\text{gallon}}{\text{min}} \times 1.0216\frac{\text{lb}}{\text{gallon}} = 51\frac{\text{lb}}{\text{min}}$$ <This is the amount of Salt entering the tank>

· The tank also contains => 1200 gallon of water <with diss salt>
The ~~sam~~ Solution that leaves the tank per min => 30 gallons

$$\therefore \frac{30\text{ gallon}}{1200\text{ gallon}} = 0.025\%$$ <That is 2.5% of the content of the tank>

∴ y_{out} = 2.5% of y <because 2.5% of the Salt present in the tank will also leave the tank/min>

∴

ii, dy/dt lb/min = 51 lb/min − 2.5% of y lb/min

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

$$dy/dt = 0.025\left\langle \frac{-0.025y}{-0.025y} + \frac{51}{-0.025} \right\rangle; \quad dy/dt = -0.02\langle y - 2040\rangle$$

$$\therefore \frac{dy}{\langle y - 2040\rangle} = -0.025\,dt; \quad \int \frac{dy}{\langle y - 2040\rangle} = \int -0.025\,dt$$

$$\int \frac{dy}{\langle y-2040\rangle} = -0.025 \int dt \; : \ln\langle y-2040\rangle = -0.025t + C$$

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

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

$y = y_0 e^{-0.025t} + 2040$; When $t = 0$ ⟨Initially⟩ $y = 15016$;

$150 = y_0 e^{-0.025\langle 0\rangle} + 2040$; $150 - 2040 = y_0 \times 1$;

$y_0 = -1890$

[illegible]; 50;

$y = -1890\, e^{-0.025t} + 2040$

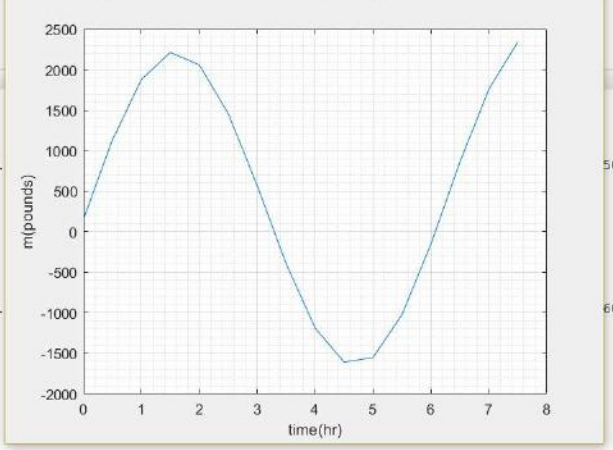
$y = 2040 - 1890 e^{-0.025t}$ //

folawiyo.m

```
1 -  commandwindow
2 -  clear
3 -  clc
4 -  close all
5 -  syms m t
6 -  t = [0:0.5:7.5]
7 -  m = 2000*(1+sin(t)) - 1850*exp(-0.025*t)
8 -  plot(t,m)
9 -  grid minor
10 -  grid on
11 -  xlabel('time(hr)')
12 -  ylabel('m(pounds)')
```

Figure 1

File Edit View Insert Tools Desktop Window Help



Command Window

```
t =

         0    0.5000    1.                                                  5000    5.0000    5.5000    6.0000    6.5000    7.0000    7.5000

m =

    1.0e+03 *

    0.1500    1.1318    1.                                                  6082   -1.5505   -1.0234   -0.1511    0.8577    1.7610    2.3423

fx >>
```


Command Window

assignment.m

```
commandwindow
clear
clc
close all
syms t
y = (50/0.05)+((50/1.0025)*sin(t))+(((50*(0.05))/1.0025)*cos(t)
ym = 1000-(800*exp(-0.05*t))
oddValues = 1:2:500
evenValues = 2:2:500
ym = double(subs(y, oddValues))
ymm = double (subs(ym, evenValues))
totTime = 1:1:500
timeTrans = totTime'
c = reshape([ym,ymm],[],1)
combVal = double(c)
plot(totTime, c)
grid on
grid minor
xlabel('T(min)'), ylabel('V(litre)')
col_header = {'t(min)', 'V(Litre)'}
xlswrite['odevbesdata.xlsx',col_header,'veriler','A2')
xlswrite['odevbesdata.xlsx',timeT,'veriler','A3')
xlswrite['odevbesdata.xlsx',combined,'veriler','B2')
```

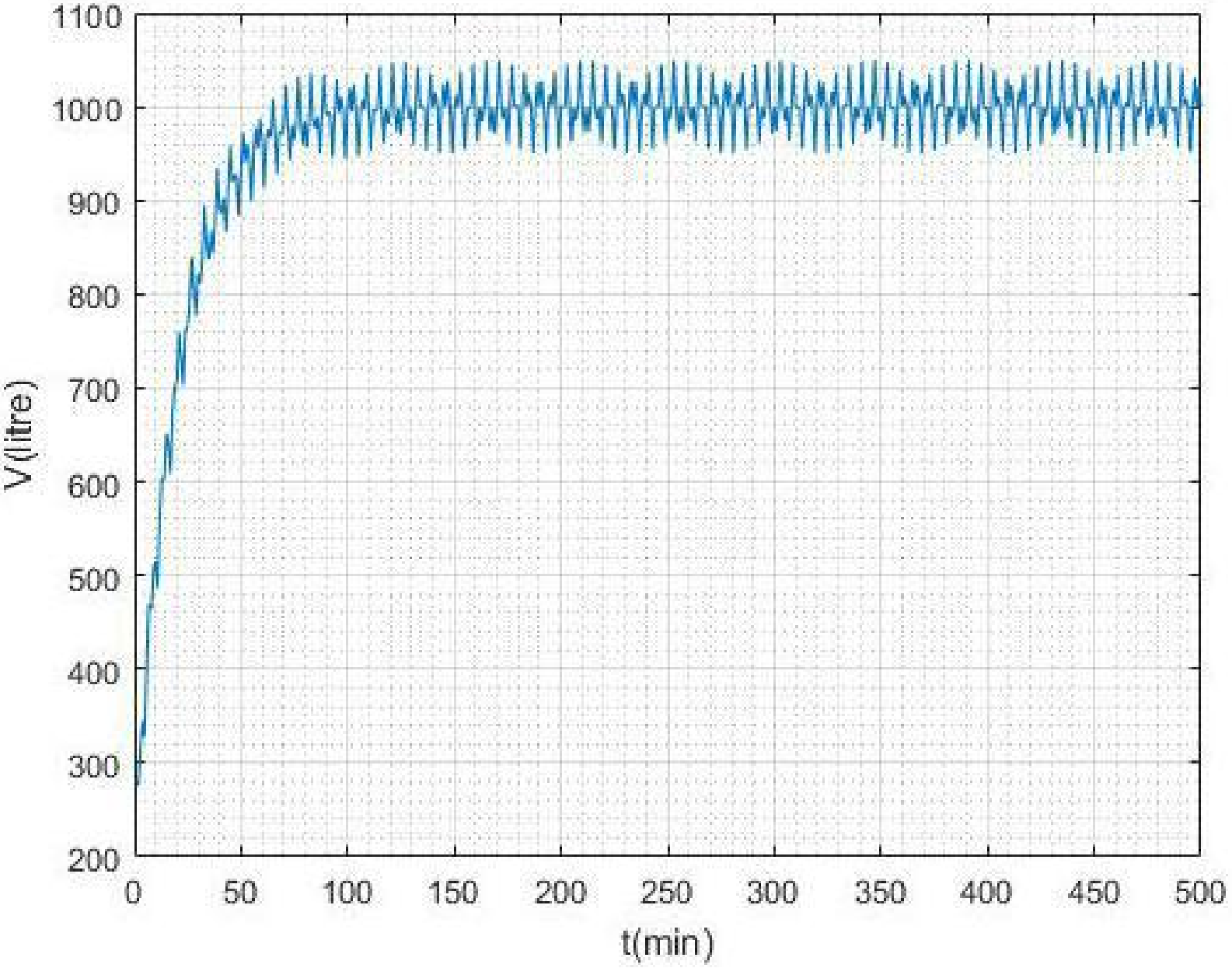
Workspace

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)