GLNLGEME STANLEY 15IENG04/039 ELECT/ELEC

1) "Salt Balance law", the acceleration rate of of salt within a system is equal to the input rate of salt into the system minus the output rate of salt from the system

Acceleration rate of salt within a system = input rate of salt into the system
- output rate of salt from the system

Let the amount of salt present in the tank at any time 't' be 'y'

Time rate of change of $y = \frac{dy}{dt} = y_{in} - y_{out}$

If 50 gal of brine enters the tank per minute and a gallon of brine has (1 lb) of salt, then

at the $t = 1$, (1 lb salt) = (1 lb salt/gal) = (0.02 lb/gal)

Hence the amount of salt among the tank is

50 gal/min × 0.02 lb/gal = 1 lb/min

The tank contains 120 gal of water with dissolved salt and 30 gal of the solution exists in the tank per min i.e. $\frac{30\text{gal}}{120\text{gal}} = 0.025 = 2.5\%$

of the content of the tank so 2.5% of the salt present inside the tank will also leave the tank per minute. i.e

$y_{out} = 2.5\%$ of y

a) $\frac{dy}{dt}$ (lb/min) = 5 lb/min − 2.5% of y lb/min

) $\frac{dy}{dt} = 5 - 0.025y$; $\frac{dy}{dt} = -0.025y + 5$

$$\frac{dy}{dt} = -0.025\left(\frac{-0.025y}{-0.025} + \frac{5}{-0.025}\right); \frac{dy}{dt} = 0.02(y - 2040)$$

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

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

$$y - 2040 = e^{-0.025t + C}; \quad y - 2040 = e^{-0.024} e^{C}$$

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

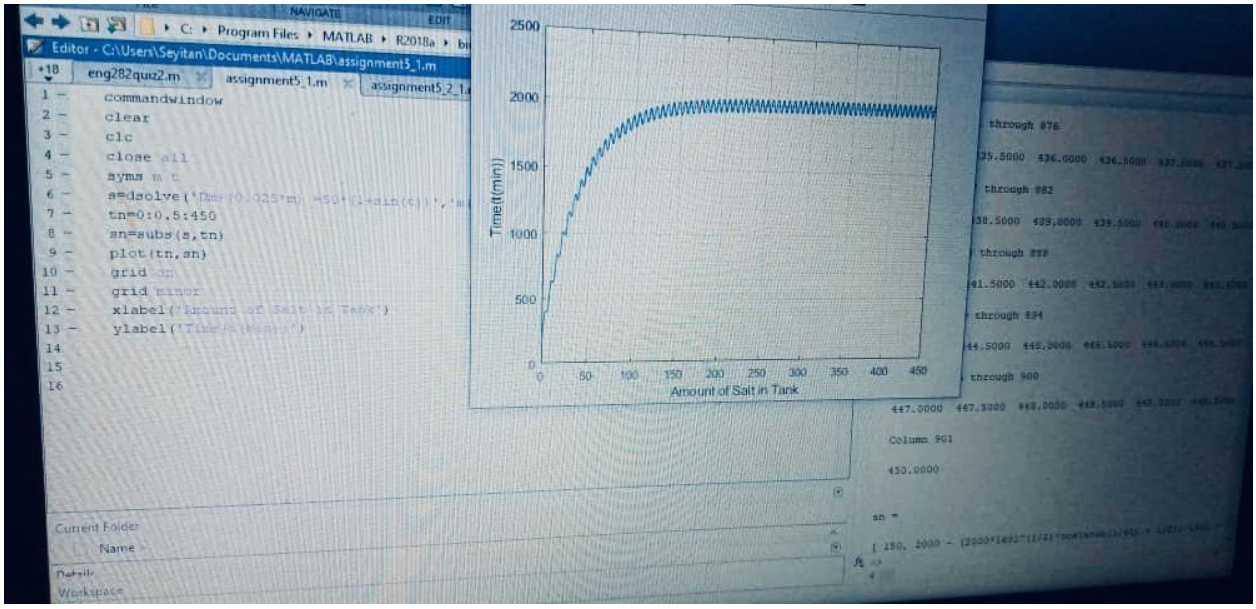
$y = y_0 e^{-0.025t} + 2040$, initially when $t = 1$, $y = 150$ lb

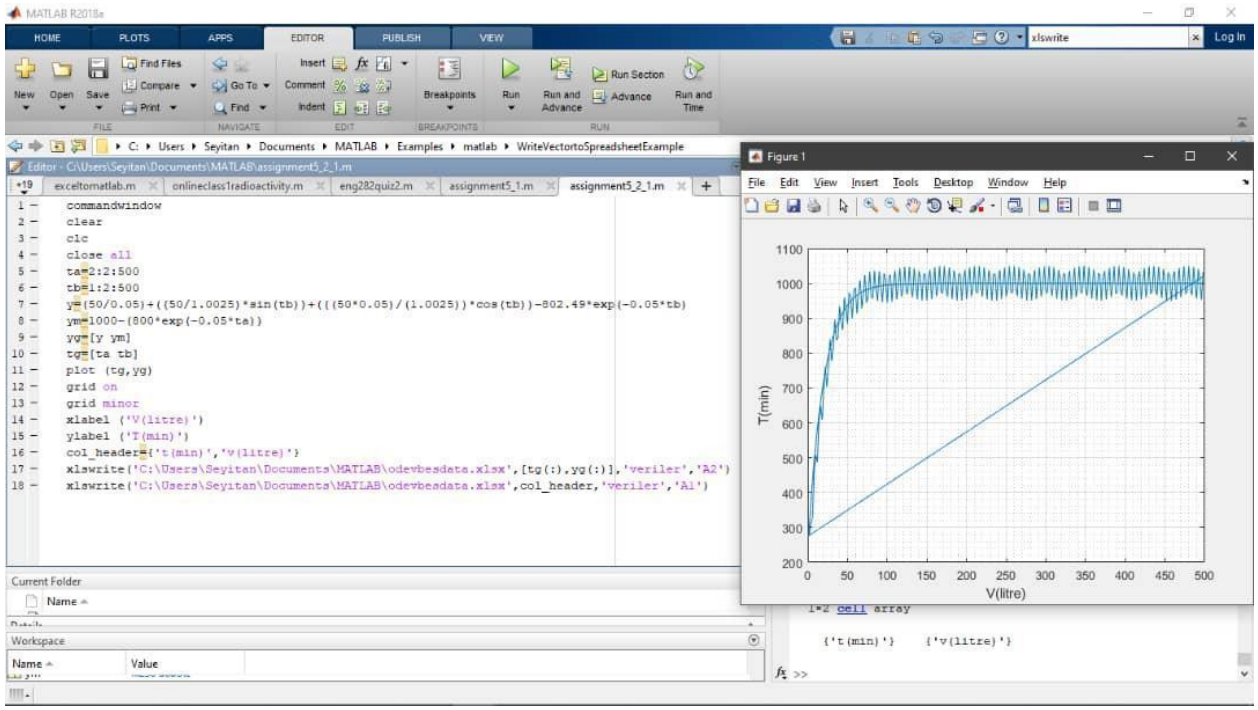
$150 = y_0 e^{-0.025t} + 2040$; $150 - 2040 = y_0 \times 1$

$y_0 = -1890$

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

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


C: ▸ Program Files ▸ MATLAB ▸ R2018a ▸
Editor - C:\Users\Seyitan\Documents\MATLAB\assignment5_1.m
eng282quiz2.m
assignment5_1.m
1 – commandwindow
2 – clear
3 – clc
4 – close all
5 – syms m t
6 – s=dsolve('Dm=(0.025*m) -450*(1+sin(t))','m
7 – tn=0:0.5:450
8 – sn=subs(s,tn)
9 – plot(tn,sn)
10 – grid on
11 – grid minor
12 – xlabel('Amount of Salt in Tank')
13 – ylabel('Time(t(min))')
14
15
16
Time(t(min))
Amount of Salt in Tank
2500
2000
1500
1000
500
0
0
50
100
150
200
250
300
350
400
450
through 876
through 882
through 888
through 894
through 900
Column 901
450.0000
sn =
Current Folder
Name
Details
Workspace


MATLAB R2018a
HOME
PLOTS
APPS
EDITOR
PUBLISH
VIEW
xlswrite
Log In
New
Open
Save
Find Files
Compare
Print
Go To
Find
Insert
Comment
Indent
Breakpoints
Run
Run and Advance
Run Section
Advance
Run and Time
FILE
NAVIGATE
EDIT
BREAKPOINTS
RUN
C: ▸ Users ▸ Seyitan ▸ Documents ▸ MATLAB ▸ Examples ▸ matlab ▸ WriteVectortoSpreadsheetExample
Editor - C:\Users\Seyitan\Documents\MATLAB\assignment5_2_1.m
exceltomatlab.m
onlineclass1radioactivity.m
eng282quiz2.m
assignment5_1.m
assignment5_2_1.m
commandwindow
clear
clc
close all
ta=2:2:500
tb=1:2:500
y=(50/0.05)+((50/1.0025)*sin(tb))+(((50*0.05)/(1.0025))*cos(tb))-802.49*exp(-0.05*tb)
ym=1000-(800*exp(-0.05*ta))
yg=[y ym]
tg=[ta tb]
plot (tg,yg)
grid on
grid minor
xlabel ('V(litre)')
ylabel ('T(min)')
col_header={'t(min)','v(litre)'}
xlswrite('C:\Users\Seyitan\Documents\MATLAB\odevbesdata.xlsx',[tg(:),yg(:)],'veriler','A2')
xlswrite('C:\Users\Seyitan\Documents\MATLAB\odevbesdata.xlsx',col_header,'veriler','A1')
Figure 1
File Edit View Insert Tools Desktop Window Help
T(min)
V(litre)
1100
1000
900
800
700
600
500
400
300
200
0 50 100 150 200 250 300 350 400 450 500
Current Folder
Name
Workspace
Name
Value
1×2 cell array
{'t(min)'} {'v(litre)'}
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