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Dept: Computer Engineering
MAT NO: 18/ENG02/038
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Assignment

1) Applying the balance law

Accumulation rate = Input rate of salt − Output rate of salt within system into the system salt from the system

Time rate of change is given as

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

50 gal of brine enters the tank per minute and one gallon contains $(1+\sin t)$ lb of salt; at $t=1$; $(1+\sin t) = (1+\sin(1)) = 1.021$b of salt; ∴ it means that the amount of salt entering the tank is $y_{in} = 50\ \frac{gal}{min} \times 1.0\ \frac{lb}{gal} = 51\ \frac{lb}{min}$

The tank contains 1200 gal of water with the dissolved salt, 30 gallons of the solution leaves the tank per minute. That is $\frac{30\ gal}{1200\ gal} = 0.025 =$ 2.5% of the concent of the tank. 2.5% of the salt present in the tank per minute

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

a) Therefore: $\frac{dy}{dt}\ \frac{lb}{min} = 5\ \frac{lb}{min} - 2.5\%$ of $y\ \frac{lb}{min}$

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

$\frac{dy}{dt} = -0.025\left[\frac{-0.025y}{-0.025y} + \frac{5}{-0.025}\right]$; $\frac{dy}{dt}$

$= -0.025(y - 200)y$

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

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

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

$y - 2040 = e^{-0.024} y$; $y - 2040 = y_0 e^{-0.025t}$;

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

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

$y_0 = -1890$

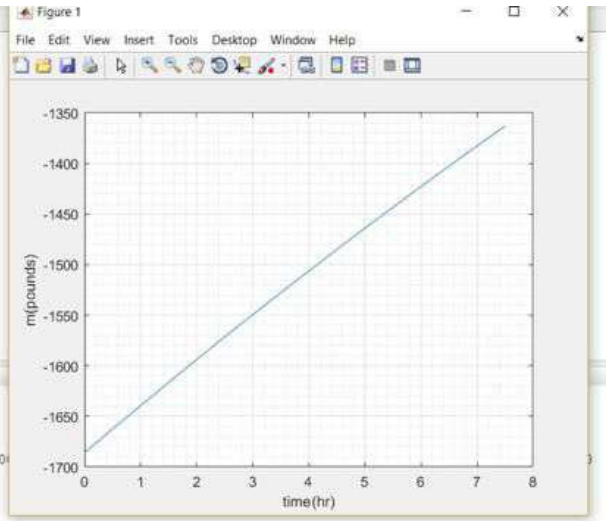
So ;

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

$y = 2040 - 1810 e^{-0.025t}$ //

okopido.m

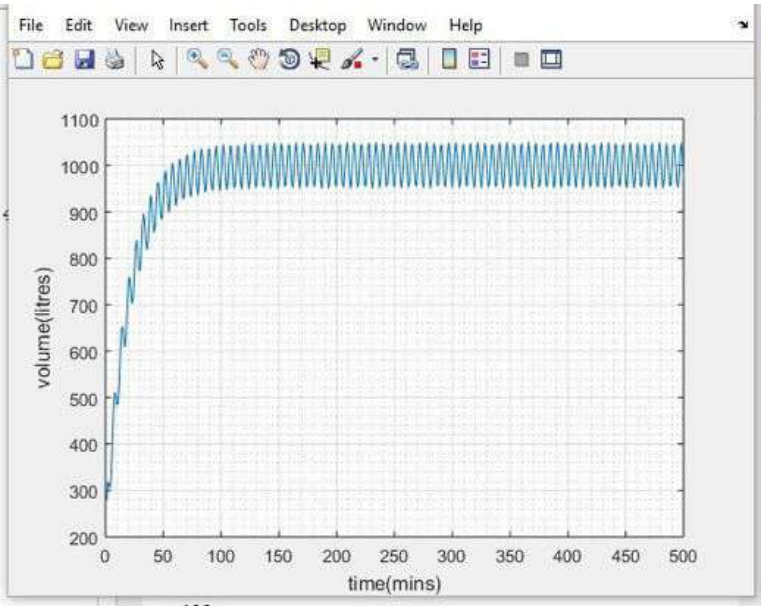
```
commandwindow
clear
clc
close all
syms m t
t = [0:0.5:7.5]
m= 204 - 1890*exp(-0.025*(t))
plot(t,m)
xlabel('time(hr)')
ylabel('m(pounds)')
grid on
grid minor
```



Command Window

```
t =

         0    0.5000    1.0000    1.5000    2.0000    2.5000    3.000                                   7.0000    7.5000

m =

   1.0e+03 *

   -1.6860   -1.6625   -1.6393   -1.6164   -1.5938   -1.5715   -1.5494   -1.5277   -1.5061   -1.4849   -1.4639   -1.4432   -1.4227   -1.4025   -1.3826   -1.3629

fx >>
```

```
commandwindow
clear
clc
close all
syms t
values=[]
t=1:1:500
mean=1000-((exp(-0.05*t))*800)
y=1000+(50/1.0025)*sin(t)+(2.5/1.0025)*cos(t)-((exp(-0.05*t))*802.4

if rem(t,2) ==0
    values=[values,mean]
else
    values=[values,y]
end
excelvalues=transpose(values)
mins=transpose(t)
plot(t,values)
grid on
grid minor
xlabel ('time(mins)')
ylabel('volume(litres)')
xlswrite('odevbesdata.xlsx',{'t(min)'},'veriler','A1')
xlswrite('odevbesdata.xlsx',mins,'veriler','A2')
xlswrite('odevbesdata.xlsx',{'V(Litre)'},'veriler','B1')
xlswrite('odevbesdata.xlsx',excelvalues,'veriler','B2')
```




```
498
499
500
>>
```