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19/ENG06/017

ENG282

(1) Using 'Balance law', The acceleration rate of salt with 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 $\frac{dy}{dt}$

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

If 50 gal of brine enters the tank per minute and one gallon contains (1+sin t) lb of salt,

∴ the amount of salt entering into the tank is

$$50\ gal/min \times 1.02\ lb/gal = 51\ lb/min$$

The tank contains 1200 gal of water dissolved salt and 30 gal of the solution exits the tank per min i.e $\frac{30}{1200} = 0.025 = 2.5\%$

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 = 51 lb/min − 2.5% of y lb/min

(b) $\frac{dy}{dt} = 51 - 0.025y$, $\frac{dy}{dt} = -0.025y + 51$

$$\frac{dy}{dt} = -0.025\left(\frac{-0.025y}{0.025} + \frac{51}{-0.025}\right); \frac{dy}{dt} = -0.02(y - 2040)$$

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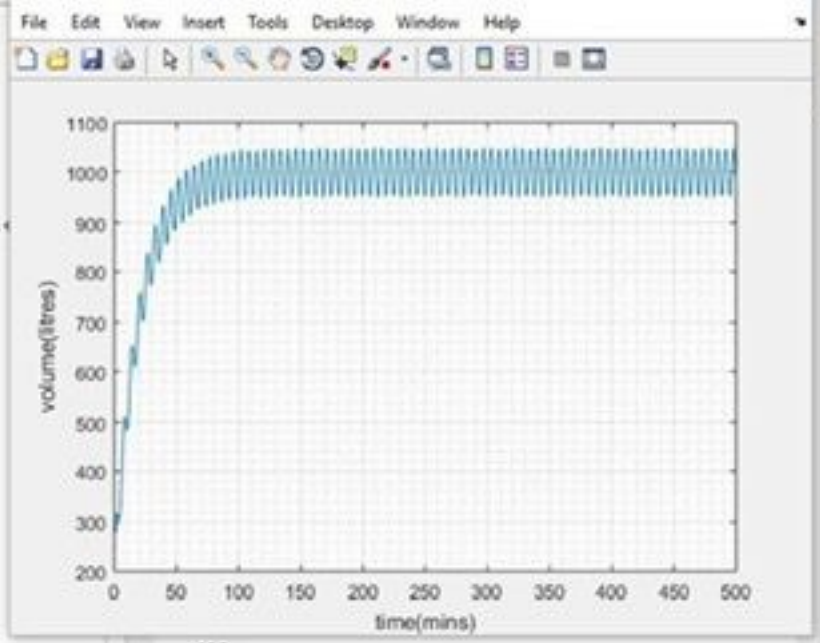
B2 279.963914100068

t(min)	V(Litre)
1	279.9639
2	318.1907
3	313.8601
4	303.601
5	327.9009
6	393.9093
7	469.1423
8	511.0566
9	506.5922
10	484.0395
11	487.1398
12	534.9268
13	604.2024
14	651.2431
15	651.4694
16	622.6706
17	608.3676
18	637.9229
19	699.585
20	751.3315
21	759.541
22	729.9392
23	702.3679
24	714.1865
25	765.9535
26	820.9421
27	838.9333
28	813.2194
29	776.7953

```
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
fx >>
```

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

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

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

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

$y = y_0 e^{-0.025t} + 2040$, as at when $t = 1$, $y =$ 1 scab

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

$y_0 = -1890$

So;

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

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