ENIOLA - ATIPE OLUWACOBUTU
18/ENG04/1033

ELECTRICAL/ELECTRONICS ENGINEERING.

1 Using "Balance law" The accelaration rate of salt within is equal to the input rate of salt into the system minus output rate of salt from the system.

Accelaration 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 at any time

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

If 50gal of brine enters the tank per minute & one gallon contains (1+Sin t) lb of salt then the rate $= \frac{1}{1}(1+\sin t) = (1+\sin t) = 1.02$ lb.

Hence the amount of salt entering into the tank is 50gal/min × 1.02 lb/gal = 51 lb/min.

The tank contains 1200 gal of water with dissolved salt and 30gal of the salt exits the tank per min i.e. $\frac{30\,gal}{1200\,gal} = 0.025.25$

Of the content of the tank so 2.5% of the salt present in the tank all leave the tank per unit lb.

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

$\frac{dy}{dt}$ lb/min = 51 lb/min − 2.5% of y lb/min.

9. $\frac{dy}{dt} = 51 - 0.025$; $\frac{dy}{dt} = 0.025y + 51$.

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

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

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

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

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

$$y = y_0 e^{-0.025t} + 2040; \text{ Initially, when } t = 1,\ y = 1500$$

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

$$y_0 = -1890$$

50;

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

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

MATLAB R2018a

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```
1  commandwindow
2  clear
3  clc
4  close all
5  ta=2:2:500
6  tb=1:2:500
7  y=(50/0.05)+((50/1.0025)*sin(tb))+(((50*0.05)/(1.0025))*cos(tb))-802.49*exp(-0.05*tb)
8  ym=1000-(800*exp(-0.05*ta))
9  yg=[y ym]
10 tg=[ta tb]
11 plot (tg,yg)
12 grid on
13 grid minor
14 xlabel ('V(litre)')
15 ylabel ('T(min)')
16 col_header={'t(min)','v(litre)'}
17 xlswrite('C:\Users\Seyitan\Documents\MATLAB\odevbesdata.xlsx',[tg(:),yg(:)],'veriler','A2')
18 xlswrite('C:\Users\Seyitan\Documents\MATLAB\odevbesdata.xlsx',col_header,'veriler','A1')
```

Figure 1

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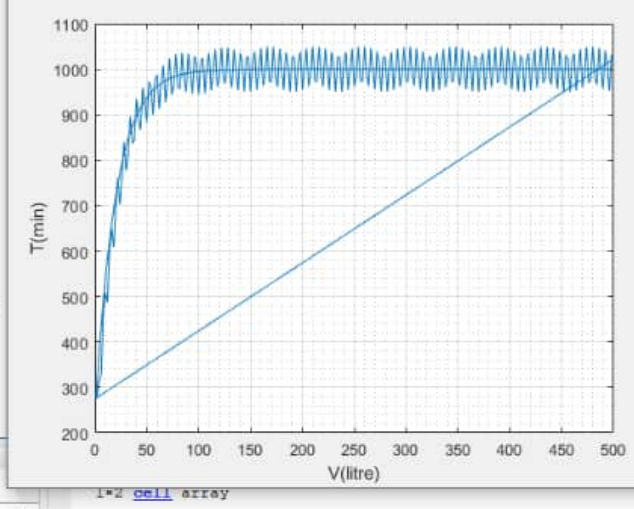

Current Folder

Name

Workspace

Name | Value

1×2 cell array

{'t(min)'} {'v(litre)'}

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