$\frac{dy}{dt}$ which is $= -0.025$

$\left(\frac{-0.025y}{-0.025y} \cdot \frac{+s}{-0.025}\right)$

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

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

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

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

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

$y = y_0 e^{-0.025} + 2040$.

When $t = 1$, $y = 1506$

$= 150 = y_0 e^{-0.025t} + 2040$

$= 150 - 2040 = y_0 \times 1$

$y_0 = -1890$

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

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

NAME: AUDU FATIMAH

DEPT: BIOMEDICAL

COURSE: ENG 282

MATRIC: 18/ENG05/004

Q1:

The Balance law states that the rate of accumulation of salt within the system is equal to the input rate of salt into the system, thereby subsidizing the output rate.

Therefore

I - R.S - O - R.S

Which is Input rate of salt - output rate of salt

Assume salt present in tank at anytime is "y".

Therefore the time Rate change of $y = \frac{dy}{dt} = y_{in} - y_{out}$

$\therefore$ 50 gal/min

each gallon containing $(1 + \sin t)$ lb of dissolved salt

When $t = 1$, $\therefore (1 + \sin t) = (1 + \sin(1))$

$= 1.0216$

$50\ \text{gal/min} \times 1.0216/\text{gal}$

cross multiply

$= \frac{50\ \text{gal}}{1\ \text{min}} \times \frac{1.0216}{\text{gal}} = \frac{51.16}{\text{min}} = 51.16/\text{min}$

$\therefore$ 51.16/min is the amount of salt that entered the tank

The tank contains 1200 gal of water in which 150 lb of salt is dissolved Salt solution, 30 gal of the solution leaves the tank every minute:

$= \frac{30}{1200}(\text{gal}) = 0.025 - 2.5\%$ of

Content of tank.

$\therefore$ 2.5% of the salt in the tank will also have tank every minute

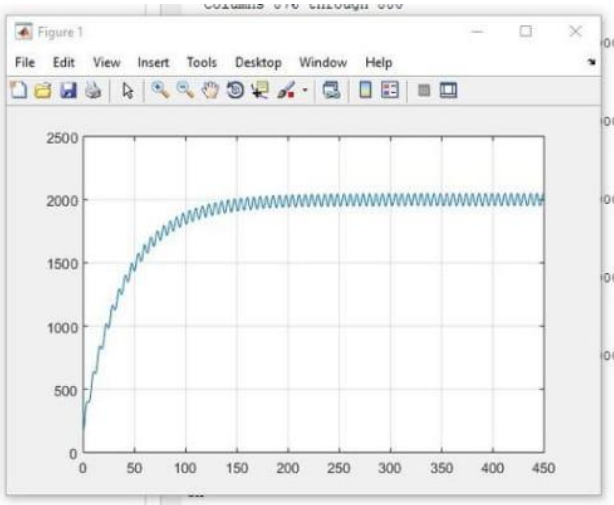
Therefore $y_{out} = 2.5\%$

For a) Differential equation for dynamics of amount of salt in tank

$\therefore \frac{dy}{dt}\ \text{lb/min} = 51\ \text{lb/min} - 2.5\%$ of y lb/min

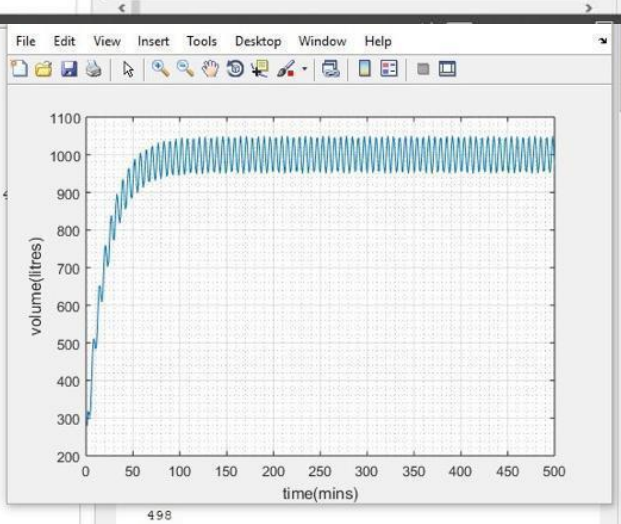
for b) $\therefore dy/dt = 51 - 0.025y$; $\frac{dy}{dt} = -0.025y + 51$

```
commandwindow
clear
clc
close all
syms m t
ans=dsolve('Dm=0.025*m-50+50*sin(t)','m(0)=150')
t=0:0.5:450
tn=subs(ans,t)
plot(t,tn)
grid on
```




```
[ 150, 2000 - (2000*1601^(1/2)*cos(atan(1/40) + 1/2))/1
>>
```

```
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.
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
>>
```