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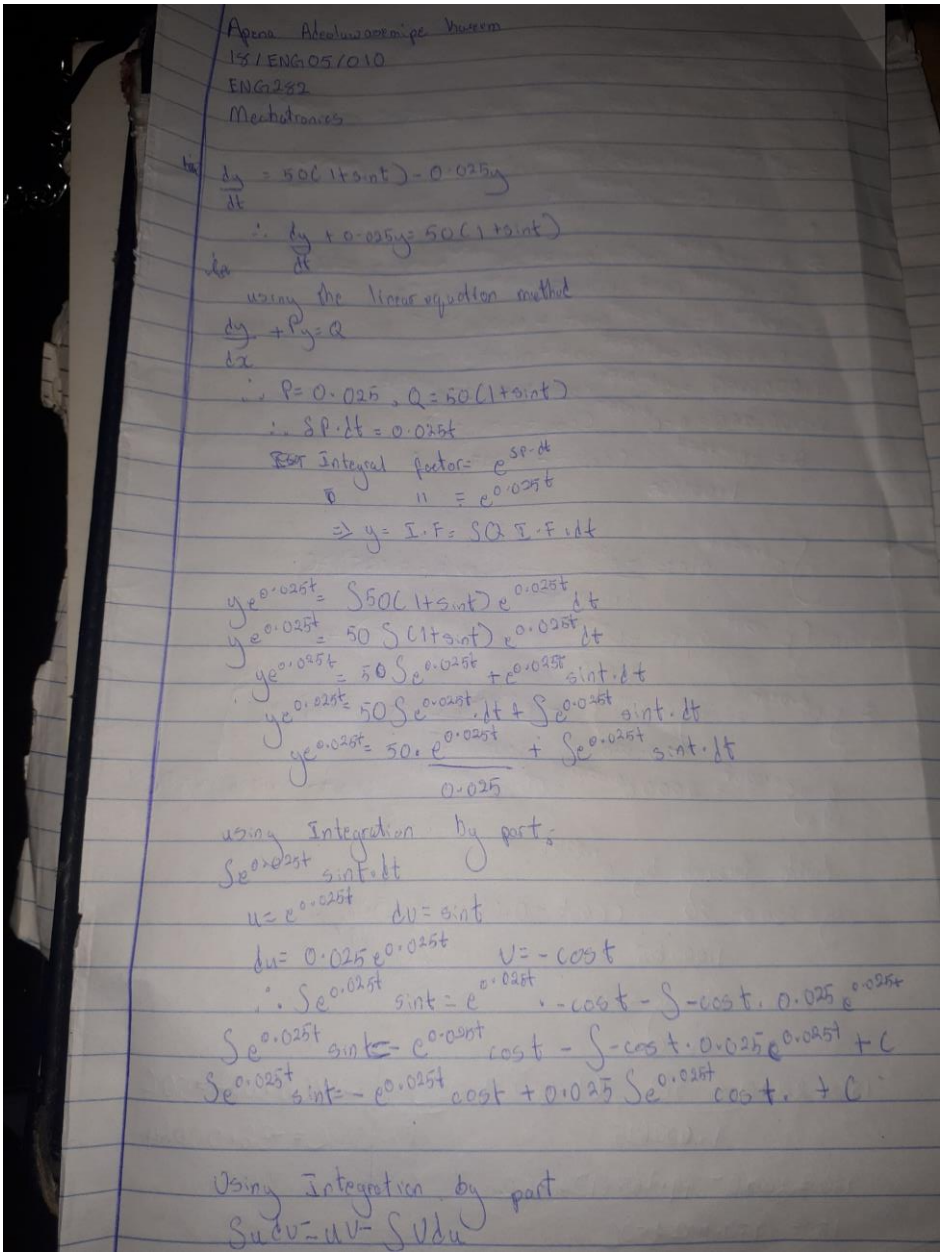
DEPT: **MECHATRONICS**

MATRIC NO.: **18/ENG05/010**



$u = e^{0.025t}$ $dv = \cos t$

$du = 0.025 e^{0.025t}$ $v = \sin t$

$= -e^{0.025t}\cos t + 0.025\left[e^{0.025t}\sin t - \int \sin t \cdot 0.025 e^{0.025t}\right]$

$= -e^{0.025t}\cos t + 0.025\left[e^{0.025t}\sin t - 0.025\int \sin t\, e^{0.025t}\right]$

Let $Q = \int e^{0.025t}\sin t$

$\Rightarrow Q = -e^{0.025t}\cos t + 0.025\left[e^{0.025t}\sin t - 0.025Q\right]$

$Q = -e^{0.025t}\cos t + 0.025 e^{0.025t}\sin t - 6.25^{-4} Q$

$Q + 6.25^{-4} Q = -e^{0.025t}\cos t + 0.025 e^{0.025t}$

$Q + 0.000626Q = -e^{0.025t}\cos t + 0.025 e^{0.025t}$

$1.000625Q = e^{0.025t}\cos t + 0.025 e^{0.025t}$

$1.000625Q = e^{0.025t}(\cos t - 0.025)$

$Q = \frac{e^{0.025t}}{1.000625}(\cos t - 0.025) + C$

$\int e^{0.025t}\sin t = \frac{-e^{0.025t}}{1.000625}(\cos t - 0.025) + C$

since $\int e^{0.025t}\sin t = \frac{-e^{0.025t}}{1.000625}(\cos t - 0.025) + C$

$\Rightarrow y e^{0.025t} = 50\left[\frac{-e^{0.025t}}{0.025} - \frac{e^{0.025t}}{1.000625}(\cos t - 0.025) + C\right]$

$y e^{0.025t} = 2000 e^{0.025t} - 50 \cdot \frac{e^{0.025t}}{1.000625}(\cos t - 0.025) + 50C$

divide through by $e^{0.025t}$

$y = 2000 - \frac{50}{1.000625}(\cos t - 0.025) + \frac{50C}{e^{0.025t}}$

when $y = 150$

$t = 0$

$150 = 2000 - \frac{50}{1.000625}(1 - 0) + 50C$

$150 = 2000 - 49.968(1) + 50C$

$150 = 1950.032 + 50C$

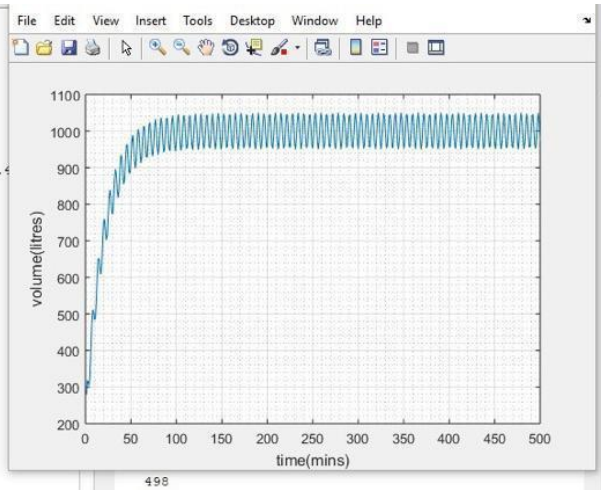
$-1800.032 = 50C$

$C = -36.0006$

```
commandwindow
clear
close all

syms m(t)

in = 50*(1 + sin(t))
out = (30/1200)*m
rate = diff(m, t)
m = dsolve(rate == in - out, m(0) == 150)

t = 0:0.5:450
x = subs(m, t)

plot(t, x)
grid on
grid minor
xlabel('time(hours)')
ylabel('amount of salt(lb)')
```

Command Window

```
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 >>

From

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

$\frac{dy}{dt} = 50(1+\sin t) - 2.5 \text{ of } y$

$\frac{dy}{dt} = 50(1+\sin t) - 0.025y$

∴ by separating the variables

$\frac{dy}{dt} + 0.025y = 50(1+\sin t)$

Multiply both sides by dt

$0.025y\,dy = 50(1+\sin t)\,dt$

$\frac{0.025y^2}{2} = \int [50 + 50\sin t]\,dt$

$\frac{0.025y^2}{2} = 50t - 50\cos t + C$

$0.0125y^2 = 50t - 50\cos t + C$

divs by 0.0125

$y^2 = 4000t - 4000\cos t + 80C$

$y^2 = 4000(t - \cos t) + 80C$

$y = \sqrt{4000(t-\cos t) + 80C}$