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Matric NO: 18/ENG07/005

1(a) $dy/dt = 50(1+\sin t) - 0.025y$

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

By applying linear equation method

$dy/dx + Py = Q$

$\therefore P = 0.025 \qquad Q = 50(1+\sin t)$

$\int P \cdot dt = 0.025t$

$I.F = e^{\int P \cdot dt}$

$I.F = e^{0.025t}$

$y \cdot I.F = \int Q \cdot I.F \cdot dt$

$ye^{0.025t} = \int 50(1+\sin t) e^{0.025t} dt$

$ye^{0.025t} = 50 \int (1+\sin t) e^{0.025t} dt$

$ye^{0.025t} = 50 \int e^{0.025t} + e^{0.025t} \sin t \cdot dt$

$ye^{0.025t} = 50 \int e^{0.025t} \cdot dt + \int e^{0.025t} \sin t \cdot dt$

$ye^{0.025t} = 50 \cdot \frac{e^{0.025t}}{0.025} + \int e^{0.025t} \sin t \cdot dt$

using integration by part

$\int e^{0.025t} \sin t \cdot dt$

$du = 0.025 e^{0.025t}$

$v = -\cos t$

$\int e^{0.025t} \sin t = e^{0.025t} \cdot -\cos t - \int -\cos t \cdot 0.025 e^{0.025t}$

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

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

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

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

$ye^{0.025t} = 2$

Divide t

$\therefore y = 200$

when $y =$
$t = 0$
$150 = 200$

$150 = 20$
$150 = 19$
-1800
$C =$

From
$dy/dt =$
$dy/dt =$
dy/dt

By
dy/dt

By
$1 +$

$ye^{0.025t} = 2000e^{0.025t} - \frac{56 \cdot e^{0.025t}}{1.000625}(\cos t - 0.025) + 50c$

Divide through by $e^{0.025t}$

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

when $y = 150$

$t = 0$

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

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

$150 = 1950.032 + 50c$

$-1800.032 = 50c$

$c = -36.00064$

from

$dy/dt = y_{in} - y_{out}$

$dy/dt = 56(1 + \sin t) - 2.5\%$ of y

$dy/dt = 56(1 + \sin t) - 0.025y$

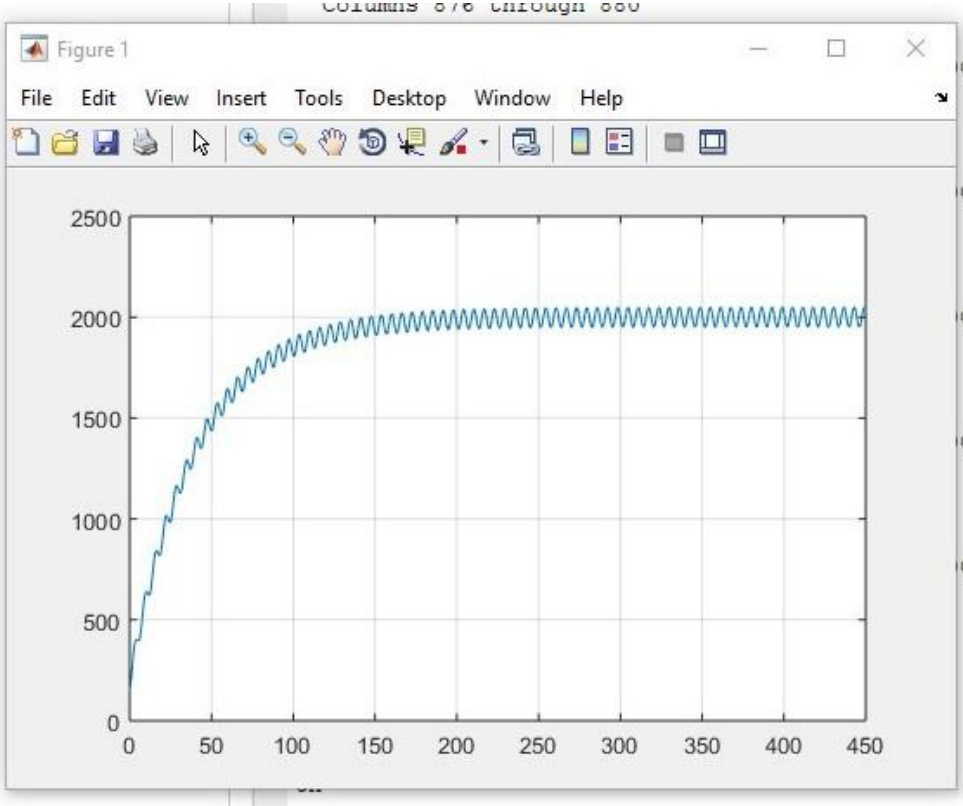
By seperating the variables,

$dy/dt + 0.025y = 56(1 + \sin t)$

By multiplying both sides by dt

$1 + 0.025y\,dy = 56(1 + \sin t)\,dt$

```
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
>>
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