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Matric No: 18/ENG03/1051

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1 $30\%/120\% = 1/40 \times 100\% = 2.5\% \therefore \frac{2.5}{100} = 0.025$ of mlb/min

Output rate $= 0.025m \frac{lb}{min}$

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

$dm/dt = -0.025m + 50(1 + \sin t)$

Compare $dy/dx + Py = Q$ and $P = 0.025$, $Q = 50(1 + \sin t)$

By Integration

$IF = e^{\int P dx} = e^{\int 0.025 dt} = e^{0.025t}$

$m \cdot IF = \int Q \cdot IF \, dt$

$m \cdot e^{0.025t} = \int Q \cdot e^{0.025t} \, dt$

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

If you integrate $50\int(1 + \sin t)e^{0.025t} \, dt$

$V = (1 + \sin t)$, $dv = \cos t$ $du = e^{0.025t}$ $u = \frac{e^{0.025t}}{0.025}$

$\therefore \int v \, du = uv - \int u \, dv$

$$\left(\frac{e^{0.025t}}{0.025}(1 + \sin t)\right) - \frac{1}{0.025}\int e^{0.025t} \cos t$$

By using Int method: $e^{0.025t} \cos t$

$$\int e^{0.025t}\cos t = \frac{e^{0.025t}}{40.025}\left(\cos t + \frac{\sin t}{0.025}\right)$$

$$\int (1+\sin t)\, e^{0.025t}$$

$$\left(\frac{e^{0.025t}}{0.025}(1+\sin t)\right) - \frac{1}{0.025}\left(\frac{e^{0.025t}}{40.025}(\cos t + \sin t/0.025)\right)$$

$$50\int (1+\sin t)\, e^{0.025t}$$

$$\frac{50}{0.025}\left(e^{0.025t}(1+\sin t)\right) - \left(\frac{e^{0.025t}}{40.025}\left(\cos t + \frac{\sin t}{0.025}\right)\right)$$

$$\Rightarrow \quad 2000\, e^{0.025t}\left((1+\sin t) - \frac{1}{40.025}\left(\frac{0.025\cos t + \sin t}{0.025}\right)\right)$$

$$2000 e^{0.025t}\left((1+\sin t) - \frac{1}{1.000625}(0.025\cos t + \sin t)\right)$$

Divide by $e^{0.025t}$

$$m = 2000\left((1+\sin t) - \frac{1}{1.000625}(0.025\cos t + \sin t)\right) + \frac{C}{e^{0.025t}}$$

$t = 0$, $m = 150$lb

$$150 = 2000\left((1+\sin(0)) - \frac{1}{1.000625}(0.025\cos(0) + \sin(0))\right) + \frac{C}{e^{0.025(0)}}$$

$$150 = 2000\left(1 - \frac{1}{1.000625}(0.025(1) + 0)\right) + \frac{C}{e^{0}}$$

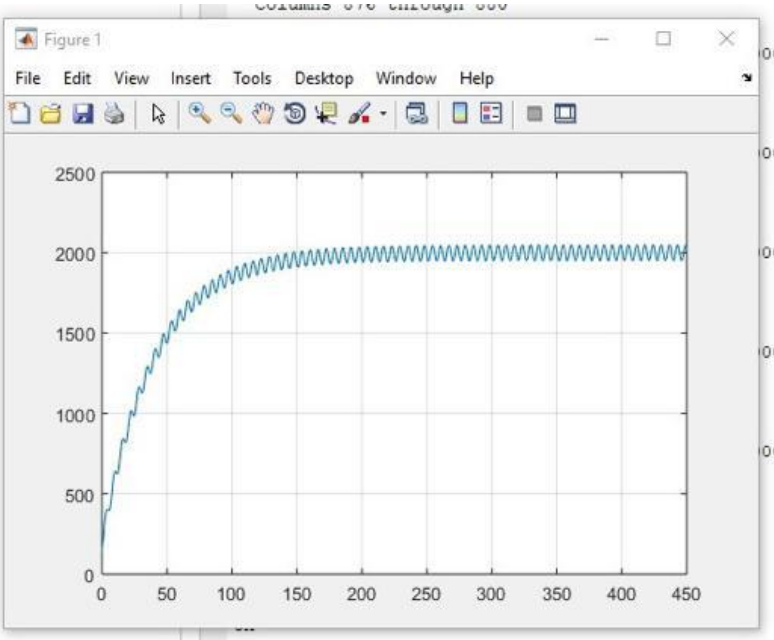
$$150 = 2000\left(1 - {}^{0.025}/_{1.000625}\right) + C$$

$$C = 150 - 2000\left(1 - {}^{0.025}/_{1.000625}\right)$$

$$C = 150 - 1950.0312304 = -1800.0312304$$

$$\therefore \quad m = \left((1+\sin t) - \frac{(0.025\cos t + \sin t)\,2000}{1.000625}\right) - \frac{1800.03}{e^{0.025t}}$$

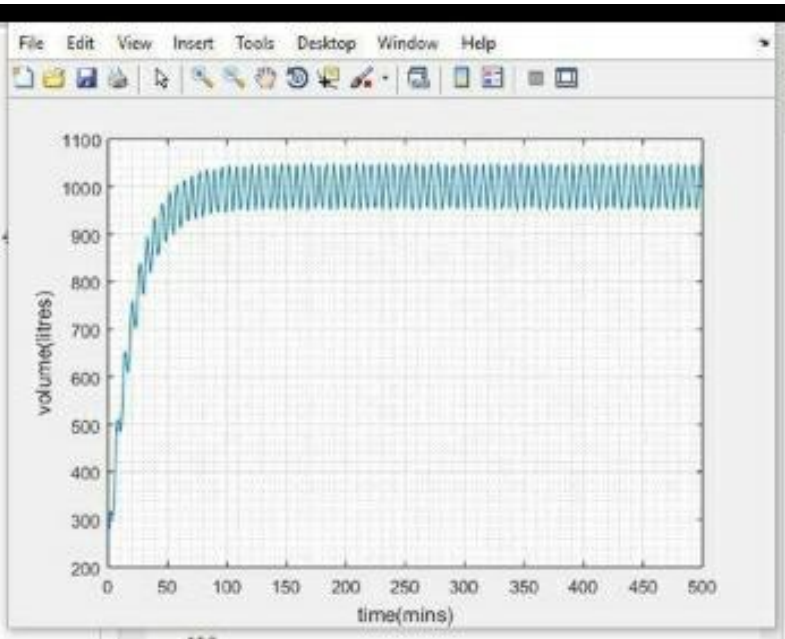
```
commandwindow
clear
clc
close all
syms m t
ans=dsolve('Dm+0.025*m=50+50*sin(t)','m(0)=150')
t=0:0.5:450
tn=subs(ans,t)
plot(t,tn)
grid on
```




```
[ 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))*802.4

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')
```

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498
499
500
>>
```