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18/ENGT01/011  
CHEMICAL ENGINEERING

ENG 282

① 1000g  
100

10 gallons each of 50  
10 gal/min

$0 < t < 70$  lb

1200g

150

50 gallons each of  
30 gal/min

$0 < t < 45$  lb

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

$$y_{in} = 50 \text{ gal/min} \times (1 + \sin t) \text{ lb/gal} \\ = 50(1 + \sin t) \text{ lb/min}$$

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

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

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

$$= -0.025 \left( \frac{-0.025y + 50 + 50 \sin t}{-0.025} \right) \\ = -0.025 (y - 2000(1 + \sin t))$$

$$\frac{dy}{dt} = -0.025 (y - 2000(1 + \sin t))$$

$$\frac{dy}{[y - 2000(1 + \sin t)]} = -0.025 dt, \quad \int \frac{dy}{[y - 2000(1 + \sin t)]} = \int -0.025 dt$$

MATLAB R2018a

HOME PLOTS APPS LIVE EDITOR INSERT FIGURE VIEW

C:\Users\Admin\Desktop\GERESH\matlab\bin\win64

Live Editor - C:\Users\Admin\Documents\Bashir.mlx

Bashir.mlx

```

commandwindow
clear all
clc
syms m(t) t
eqn = diff(m,t)+ 3*m(t)/(120+2*t) == (50*(1+sin(t)))
s = dsolve (eqn,m(0)==150)
y=simplify(s)
t=0:0.5:450
plot(subs(y,t))
grid on
grid minor
xlabel('Time (min)')
ylabel('Amount of Salt(Lbs)')

```

Figure 2: Figure

Command Window

eqn(t) =

$$\frac{d}{dt} m(t) + \frac{3m(t)}{2t+120} = 50 \sin(t) + 50$$

s =

$$\int_0^t \frac{50 (\sin(x) + 1) (x + 60)^{3/2} dx}{(t + 60)^{3/2}} + \frac{9000 \sqrt{60}}{(t + 60)^{3/2}}$$

y =

$$\frac{9000 \sqrt{60} + \int_0^t 50 (\sin(x) + 1) (x + 60)^{3/2} dx}{(t + 60)^{3/2}}$$

t = 1x501

|   |        |        |        |        |        |     |
|---|--------|--------|--------|--------|--------|-----|
| 0 | 0.5000 | 1.0000 | 1.5000 | 2.0000 | 2.5000 | ... |
|---|--------|--------|--------|--------|--------|-----|

File Explorer showing project files:

- .config
- idea
- .idea
- .PyCharmCE2019.2
- .vscode
- 3D Objects
- AppData
- Application Data
- Cisco Packet Tracer 7.0
- Contacts
- Cookies
- Desktop
- Documents
- Downloads
- Favorites

Details:

| Name  | Value        |
|-------|--------------|
| mdata | 2x2 cell     |
| t     | 1x1 sym      |
| T     | 1x501 double |
| T1    | 1x250 double |
| T2    | 1x250 double |
| y     | 1x1 sym      |
| Y     | 1x250 sym    |
| ym    | 1x1 sym      |
| Ym    | 1x250 sym    |

```

1 - commandwindow
2 - clear
3 - cloc
4 - close all
5 - format short g
6 - syms t
7 - ym=(50/0.05)+((50/1.0025)*sin(t))+((50*0.05/1.0025)*cos(t))- (802.49*exp(-0.05*t))
8 - ym=1000-(800*exp(-0.05*t))
9 - T=0:1:500
10 - T1=T(2:2:500)
11 - T2=T(1:2:500)
12 - Y=subs(y,T1)
13 - Ym=subs(ym,T2)
14 - mdata=['t (minutes)', 'V (litres)'; Y, Ym]
15 - plot(T1, Y, T2, Ym)
16 - grid on
17 - grid minor

```

MATLAB R2017a

HOME PLOTS APPS EDITOR

File Edit View Insert Tools Desktop Window Help

Figure 1

xp (-0.05\*t)

| Name  | Value        |
|-------|--------------|
| mdata | 2x2 cell     |
| t     | 1x1 sym      |
| T     | 1x501 double |
| T1    | 1x250 double |
| T2    | 1x250 double |
| y     | 1x1 sym      |
| Y     | 1x250 sym    |
| ym    | 1x1 sym      |
| Ym    | 1x250 sym    |

script Ln 11 Col 5

9:59 PM 06/05/2020