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18/ENCO1/018

Engineering mat

Assignment

19. We know that Accumulation ratio  $\Sigma$   
within a system

$$\left[ \begin{array}{l} \text{Input ratio} \\ \text{Input system} \end{array} - \begin{array}{l} \text{Output ratio} \\ \text{from system} \end{array} \right]$$

$$\frac{df}{dt} = f_{in} - f_{out}$$

$$16. f_{in} = 50 \frac{\text{gal}}{\text{min}} \times (1 + 5 \sin t) \frac{\text{lb}}{\text{gal}}$$

$$f_{in} = 50(1 + 5 \sin t) \text{ lb/min}$$

$$\frac{80}{1200} = 0.025 \times 100 = 2.5\%$$

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

$$\frac{df}{dt} = 50(1 + 5 \sin t) \text{ lb/min} - 2.5\% \text{ of } y \text{ lb/min}$$

$$\frac{df}{dt} = 50(1 + 5 \sin t) - 0.025y$$

$$\text{i.e. also } \frac{df}{dt} = -0.025y + 50(1 + 5 \sin t)$$

$$\frac{df}{dt} = -0.025 \left[ -0.025y + \frac{50(1 + 5 \sin t)}{0.025} \right]$$

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

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

By integrating both sides

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

$$y - 2000(1 + \sin t) = e^{-0.025t + C}$$

$$y - 2000(1 + \sin t) = e^{-0.025t} e^C$$

$$y - 2000(1 + \sin t) = e^{-0.025t} f_0$$

$$y = f_0 e^{-0.025t} + 2000(1 + \sin t)$$

when  $t = 0$ , initially  $y = 150$

$$150 = f_0 e^{-0.025 \cdot 0} + 2000(1 + \sin 0)$$

$$150 = f_0 + 2000$$

$$f_0 = 150 - 2000 = -1850$$

$$\therefore y = 2000(1 + \sin t) - 1850 e^{-0.025t}$$

10. Command window

clear

clc

close all

syms t

ans = dsolve('Dm + 0.025\*m = 50\*50^sin(t)', 'm(0) = 150')

t = 0:0.5:450

fn = subs(ans, t)

Plot  $(t, \ln)$

```
Command Window
New to MATLAB? See resources for Getting Started.
x =
Columns 1 through 8
    0    0.5000    1.5000    2.5000    3.5000    4.5000    5.5000    6.5000
Column 9
    7.5000
shhham(t) =
diff(y(t), t) == 51 - y(t)/40
shhham2(t) =
diff(y(t), t) == 51 - y(t)/40
S =
C3*exp(-t/40) + 2040
S =
C3*exp(-t/40) + 2040
fx >>
```

```
Editor - C:\Users\Del\Desktop\matlab and mathcad\assignment.m
assignment.m x +
1 - commandwindow
2 - clear
3 - clc
4 - close all
5 - syms y(t) a
6 - x = [0,0.5:7.5]
7 - shhham = diff(y,t) == 51-0.025*y
8 - shhham2 = diff(y,t) == -0.025*y + 51
9 - S = dsolve(shhham)
10 - S = dsolve(shhham2)
11
```

Workspace

Name	Value
a	1x1 sym
S	1x1 sym
shhham	1x1 symfun
shhham2	1x1 symfun
t	1x1 sym
x	[0,0.5000,1.5000,...
y	1x1 symfun

```
1 - commandwindow
2 - clear
3 - clc
4 - close all
5 - syms t
6 - y = (50/0.05)+((50/1.0025)*sin(t))+(((50*(0.05))/1.0025)*cos(t))
7 - ym = 1000-(800*exp(-0.05*t))
8 - oddValues = 1:2:500
9 - evenValues = 2:2:500
10 - ym = double(subs(y, oddValues))
11 - ymm = double (subs(ym, evenValues))
12 - totTime = 1:1:500
13 - timeTrans = totTime'
14 - c = reshape([ym,ymm],[],1)
15 - combVal = double(c)
16 - plot(totTime, c)
17 - grid on
18 - grid minor
19 - xlabel('T(min)'), ylabel('V(litre)')
20 - col_header = {'t(min)', 'V(Litre)'}
21 - xlswrite('odevbesdata.xlsx', col_header, 'veriler', 'A2')
22 - xlswrite('odevbesdata.xlsx', timeT, 'veriler', 'A3')
23 - xlswrite('odevbesdata.xlsx', combined, 'veriler', 'B2')
```

Workspace

Name	Value
c	62750x1 double
combVal	62750x1 double

script

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