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MATRIC NO: 181ENG061060

DEPARTMENT: MECHANICAL ENGINEERING

DATE: 5th MAY 2020

1a We know that accumulation ratio = $\left\{ \begin{array}{l} \text{Input ratio} \\ \text{into system} \end{array} - \begin{array}{l} \text{Output ratio} \\ \text{from system} \end{array} \right\}$

$$\frac{dy}{dt} = Y_m - Y_{out} \dots (2)$$

1b $Y_m = \frac{50 \text{ gal}}{\text{min}} \times (1 + 5 \sin t) \frac{\text{lb}}{\text{gal}}$

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

$$\frac{30}{1200} = 0.025 \times 100 = 2.5\%$$

$$Y_{out} = 2.5\% \text{ of } y.$$

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

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

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

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

$$\frac{dy}{dt} = -0.025(y - 2000(1 + 5mt))$$

$$\frac{dy}{(y - 2000(1 + 5mt))} = -0.025 dt$$

By integrating both sides

$$\int \frac{dy}{y - 2000(1 + 5mt)} = \int -0.025 dt$$

$$\ln(y - 2000(1 + 5mt)) = -0.025t + C$$

$$y - 2000(1 + 5mt) = e^{-0.025t + C}$$

$$y - 2000(1 + 5mt) = e^{-0.025t} e^C$$

$$y - 2000(1 + 5mt) = e^{-0.025t} y_0$$

$$y = y_0 e^{-0.025t} + 2000(1 + 5mt)$$

when $t = 0$ Grams initially $y = 150$ lb

$$150 = y_0 e^{-0.025(0)} + 2000(1 + 5m \cdot 0)$$

$$150 = y_0 + 2000$$

$$y_0 = 150 - 2000 = -1850$$

$$\therefore y = 2000(1 + 5mt) - 1850e^{-0.025t}$$

10 Command window

clear

cla

close all

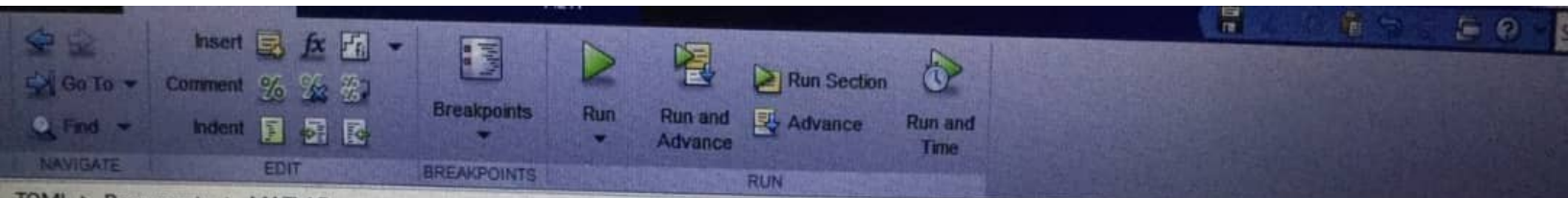
Syms mt

$$\text{ans} = \text{dsolve}('Dm + 0.025*m = 50 \times 50 * S(m,t)', 'm(0) = 150')$$

$$t = 0: 0.5: 450$$

$$tn = \text{subs}(\text{ans}, t)$$

$$\text{plot}(t, tn)$$



TOMI Documents MATLAB

```
Editor - C:\Users\TOMI\Documents\MATLAB\Untitled5.m
Untitled.m x Untitled2* x Untitled5.m x Untitled6 x +
1 - commandwindow
2 - clear
3 - clc
4 - close all
5 - syms m t
6 - ans=dsolve('Dm+0.025*m=50+50*sin(t)', 'm(0)=150')
7 - t=0:0.50:450
8 - tn=subs(ans,t)
9 - plot(t,tn)
10 - grid on
11 - grid minor
```



Command Window



New to MATLAB? See resources for [Getting Started](#).



```
tn =
[ 150, 2000 - (2000*1601^(1/2)*cos(atan(1/40) + 1/2))/1601 - (2881850*exp(-1/80))/1601, 2000 - (2000*1601^(1/2)*cos(atan(1/40) + 1/2))/1601 - (2881850*exp(-1/80))/1601]
fx >>
```



EDITOR

Insert  

Comment  

Indent  

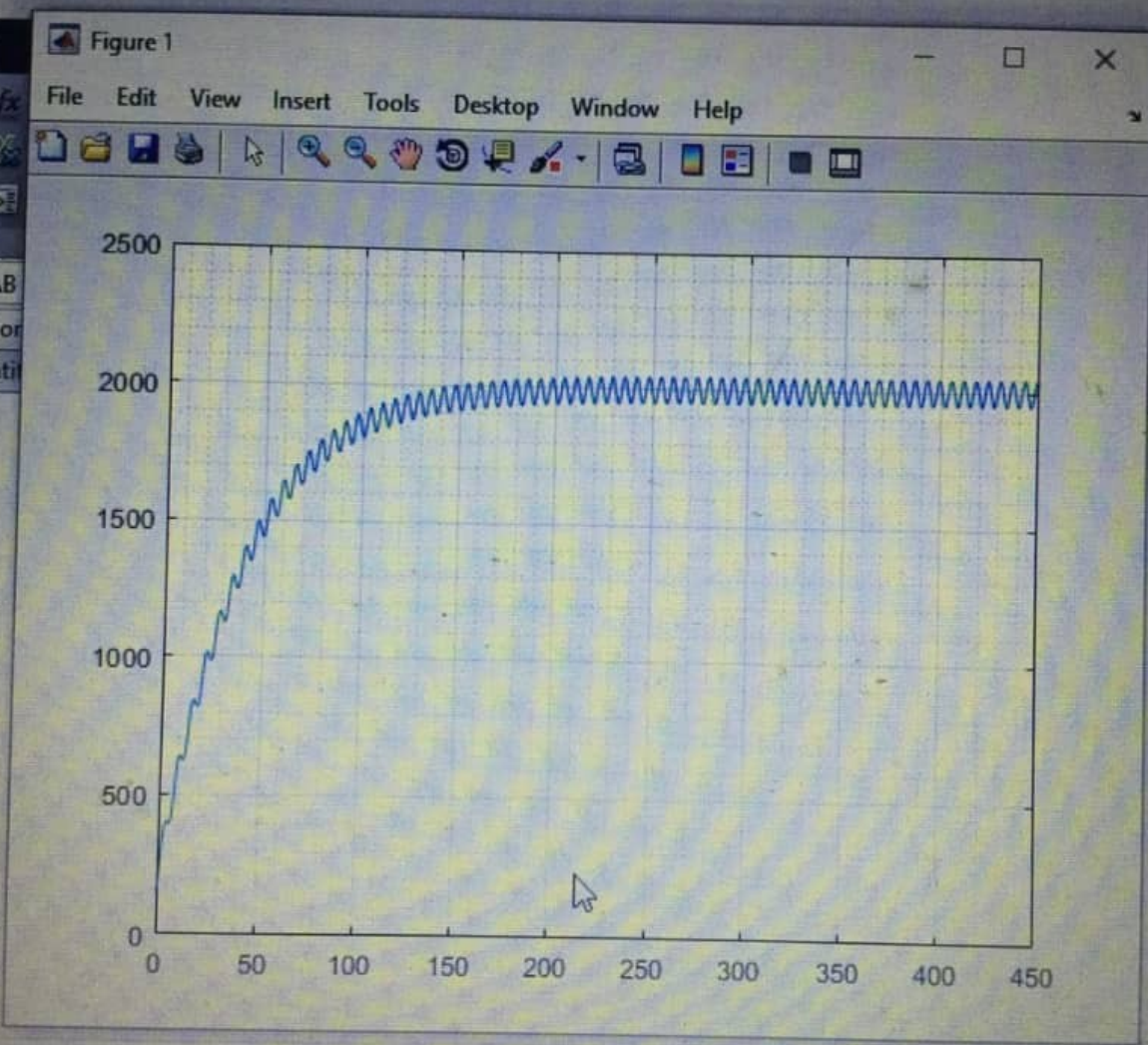
EDIT

Documents > MATLAB

Editor

Untitled

- 1 -
- 2 -
- 3 -
- 4 -
- 5 -
- 6 -
- 7 -
- 8 -
- 9 -
- 10 -
- 11 -



Command Window

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```

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(y, 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', timeTrans, 'veriler', 'A3')
23 - xlswrite('odevbesdata.xlsx', combVal, 'veriler', 'B2')

```

Workspace

Name	Value
c	62750x1 double
combVal	62750x1 double

script

Ln 23 Col 53

6:52 PM
5/6/2020

