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**DEPARTMENT: ELECTRICAL/ELECTRONICS ENGINEERING**

**COURSE: ENG382**

**ASSIGNMENT 5**

The dynamic model of a system is as given in Equation (1). If the initial value of the response is 1.4, using Euler’s method, obtain the dynamic response of the system, both in tabular and graphical forms, for time t = 0 – 0.5 hr with a step time of 0.1 hr with the aid of:

(i) Spreadsheet

 (ii) MATLAB

$$\frac{dy}{dt}=2t+y^{2}$$

Using Eulers method:

(y’)0=2t + y2

y(0)=1.4

t=0

h=0.1

y=y(0) + h\*(y’)

**EXCEL SPREADSHEET SOLUTION**

**CODE:**

RESULT:



MATLAB CODE AND CODE RESULT{COMMANDWINDOW}



commandwindow

clear

clc

close all

t=0

h=0.1

y=1.4

for i=1:5

 iter(i+1)=i

 t(i+1)= (t(i)+h);

 y(i+1)=y(i)+ h\*(2\*(t(i))+y(i)^2);

end

dove= [iter' t' y']

SOLUTION

dove =

 0 0 1.4000

 1.0000 0.1000 1.5960

 2.0000 0.2000 1.8707

 3.0000 0.3000 2.2607

 4.0000 0.4000 2.8317

 5.0000 0.5000 3.7136

**QUESTION 2**

The dynamic models of oil quantities in three interconnecting tanks with one inlet and one outlet streams are as given in Equation (2)

$$\left\{\begin{array}{c}\frac{dQ\_{1}}{dt}=-\frac{15}{500}Q\_{1}+\frac{5}{1000}Q\_{2}+1\\\frac{dQ\_{2}}{dt}=\frac{15}{500}Q\_{1}-\frac{18}{1000}Q\_{2}+\frac{3}{400}Q\_{3}\\\frac{dQ\_{3}}{dt}=\frac{13}{1000}Q\_{2}-\frac{13}{400}Q\_{3}\end{array}\right\}$$

Q1 , Q2 and Q3 are the quantities of the oil in tanks 1, 2 and 3, respectively, at any time t. If at time t = 0, Q1 = Q2 = Q3 = 0 m3, with the aid of MATLAB, taking the simulation period to be from tinitial = 0 min to tfinal = 1200 min, plot the dynamic responses of Q1 , Q2 and Q3 on the same graph. Also, write the steady state values.

SOLUTION

MATLAB CODE:



CODE2:



GRAPH RESULT: 

From the graph, the steady states values are:

For Q1: 100

For Q2: 50

For Q3: 40

WRITTEN

CODE1:

function f = dove(t,Q)

f(1)=-0.03\*Q(1)+0.005\*Q(2)+1;

f(2)=0.03\*Q(1)-0.018\*Q(2)+0.0075\*Q(3);

f(3)=0.013\*Q(2)-0.0325\*Q(3);

f=f';

CODE 2:

commandwindow

clear

clc

close all

[t,Q]=ode45('dove',[0 1200],[0 0 0])

plot(t,Q)

xlabel('Time t')

ylabel('Dynamic response Q')

legend('Q\_1','Q\_2','Q\_3')

title('graph of Dynamic response Q1,Q2 & Q3 against time t(s)')

axis tight

grid on