**Michael shallangwa**

**16/eng01/019**

**Chemical engineering**

**Maths assignment 5**

QUESTION 1

Commandwindow

Clear

Clc

2. t0 = 0;

3. tn = 0.5;

4. h = 0.1;

5. y0 = 1.4;

6. t = t0:h:tn; y(1)= y0;

7. n = length(t); %exact solution

8. for i = 1:n-1

9. dy = 2\*t(i)+(y(i))^2 ;

10. y(i+1)=y(i)+ h\*dy; %numerical solution

11. end

12. [t' y']

13. plot(t,y,'\*-')

14. ylabel('Response')

15. xlabel('Time(hour)')

16. grid on

17. grid minor

18. legend('Dynamic Response(y)')

commandwindow

>> eulermethod

ans =

0 1.4000

0.1000 1.5960

0.2000 1.8707

0.3000 2.2607

0.4000 2.8317

0.5000 3.7136

Question 2

Commandwindow

Clear

Clc

function FV = funcsyss(t,Q)

2. %Fv = [Q1;Q2;Q3]

3. FV(1,1) = (-15/500)\*Q(1)+(5/1000)\*Q(2)+1;

4. FV(2,1) = (15/500)\*Q(1)-(18/1000)\*Q(2)+(3/400)\*Q(3);

5. FV(3,1) = (13/1000)\*Q(2)-(13/400)\*Q(3);

commandwindow

>> [t, Qv] =ode45('funcsyss’, [0 1200],[0;0;0]),plot(t,Qv(:,1),'+-',t,Qv(:2),'\*-',t,Qv(:,3),'-.'),grid on, grid minor,ylabel('Quantities of the oil in tanks'),xlabel('Time(mins)'),legend('Q(1)','Q(2)','Q(3)')

t =

1.0e+03 \*

0

0.0000

0.0000

0.0000

0.0000

0.0000

0.0000

0.0000

0.0000

0.0000

0.0000

0.0000

0.0000

0.0000

0.0000

0.0000

0.0000

0.0001

0.0001

0.0001

0.0002

0.0003

0.0005

0.0006

0.0008

0.0015

0.0023

0.0030

0.0037

0.0047

0.0056

0.0065

0.0074

0.0088

0.0103

0.0117

0.0131

0.0151

0.0171

0.0191

0.0211

0.0238

0.0265

0.0293

0.0320

0.0356

0.0392

0.0428

0.0464

0.0511

0.0559

0.0607

0.0654

0.0718

0.0782

0.0846

0.0910

0.1000

0.1091

0.1181

0.1272

0.1386

0.1500

0.1615

0.1729

0.1874

0.2020

0.2165

0.2311

0.2492

0.2673

0.2855

0.3036

0.3299

0.3563

0.3826

0.4089

0.4268

0.4447

0.4625

0.4804

0.4983

0.5162

0.5340

0.5519

0.5735

0.5951

0.6167

0.6383

0.6620

0.6856

0.7093

0.7329

0.7539

0.7749

0.7959

0.8169

0.8342

0.8515

0.8687

0.8860

0.9027

0.9193

0.9360

0.9527

0.9724

0.9920

1.0117

1.0314

1.0547

1.0781

1.1014

1.1247

1.1436

1.1624

1.1812

1.2000

Qv =

0 0 0

0.0001 0.0000 0.0000

0.0001 0.0000 0.0000

0.0002 0.0000 0.0000

0.0002 0.0000 0.0000

0.0005 0.0000 0.0000

0.0007 0.0000 0.0000

0.0010 0.0000 0.0000

0.0012 0.0000 0.0000

0.0025 0.0000 0.0000

0.0037 0.0000 0.0000

0.0050 0.0000 0.0000

0.0062 0.0000 0.0000

0.0125 0.0000 0.0000

0.0188 0.0000 0.0000

0.0251 0.0000 0.0000

0.0313 0.0000 0.0000

0.0627 0.0001 0.0000

0.0940 0.0001 0.0000

0.1253 0.0002 0.0000

0.1566 0.0004 0.0000

0.3125 0.0015 0.0000

0.4676 0.0033 0.0000

0.6221 0.0059 0.0000

0.7758 0.0091 0.0000

1.4883 0.0339 0.0002

2.1854 0.0739 0.0007

2.8675 0.1285 0.0016

3.5348 0.1972 0.0031

4.3512 0.3026 0.0060

5.1458 0.4284 0.0101

5.9193 0.5737 0.0157

6.6723 0.7376 0.0230

7.7862 1.0226 0.0378

8.8559 1.3463 0.0573

9.8835 1.7060 0.0822

10.8710 2.0992 0.1126

12.2040 2.7082 0.1661

13.4654 3.3731 0.2323

14.6600 4.0879 0.3116

15.7921 4.8473 0.4046

17.2353 5.9400 0.5528

18.5802 7.0945 0.7266

19.8353 8.3010 0.9255

21.0081 9.5507 1.1491

22.4489 11.2612 1.4828

23.7717 13.0180 1.8562

24.9891 14.8080 2.2667

26.1125 16.6190 2.7114

27.4691 19.0257 3.3463

28.6985 21.4341 4.0282

29.8171 23.8300 4.7497

30.8397 26.2008 5.5044

32.0858 29.3308 6.5609

33.2039 32.3832 7.6511

34.2129 35.3481 8.7617

35.1304 38.2156 9.8826

36.2997 42.0875 11.4669

37.3397 45.7530 13.0313

38.2695 49.2164 14.5590

39.1108 52.4756 16.0393

40.0752 56.3106 17.8315

40.9370 59.8499 19.5243

41.7082 63.1156 21.1141

42.4062 66.1208 22.5986

43.2086 69.5883 24.3331

43.9199 72.7052 25.9083

44.5493 75.5085 27.3367

45.1115 78.0249 28.6261

45.7357 80.7991 30.0528

46.2782 83.2246 31.3037

46.7477 85.3470 32.4002

47.1577 87.2008 33.3598

47.6722 89.4715 34.5511

48.0907 91.3437 35.5252

48.4220 92.8994 36.3084

48.6967 94.1725 36.9575

48.8648 94.8887 37.3493

49.0091 95.5211 37.6855

49.1301 96.0858 37.9654

49.2363 96.5790 38.2121

49.3342 97.0000 38.4428

49.4186 97.3715 38.6407

49.4897 97.7026 38.8055

49.5521 97.9919 38.9506

49.6218 98.2840 39.1164

49.6794 98.5363 39.2521

49.7241 98.7608 39.3537

49.7630 98.9501 39.4427

49.8091 99.1017 39.5587

49.8434 99.2391 39.6413

49.8597 99.3828 39.6695

49.8761 99.4971 39.7021

49.9069 99.5402 39.7877

49.9261 99.5934 39.8375

49.9247 99.6804 39.8210

49.9266 99.7476 39.8171

49.9439 99.7586 39.8670

49.9547 99.7783 39.8966

49.9561 99.8146 39.8955

49.9579 99.8452 39.8964

49.9662 99.8554 39.9197

49.9718 99.8684 39.9346

49.9737 99.8870 39.9378

49.9756 99.9030 39.9410

49.9812 99.9110 39.9566

49.9848 99.9207 39.9659

49.9850 99.9358 39.9645

49.9857 99.9478 39.9647

49.9928 99.9449 39.9863

49.9960 99.9488 39.9955

49.9912 99.9697 39.9781

49.9888 99.9834 39.9689

49.9952 99.9742 39.9892

49.9981 99.9723 39.9982

49.9949 99.9838 39.9871

49.9928 99.9923 39.9797

>> [t,Qv]=ode23('funcsyss',[0 1200],[0;0;0]),plot(t,Qv(:,1),'+-',t,Qv(:,2),'\*-',t,Qv(:,3),'-.'),grid on, grid minor,ylabel('Quantities of the oil in tanks'),xlabel('Time(mins)'),legend('Q(1)','Q(2)','Q(3)')

t =

1.0e+03 \*

0

0.0000

0.0000

0.0000

0.0000

0.0001

0.0003

0.0006

0.0010

0.0014

0.0018

0.0023

0.0027

0.0031

0.0037

0.0043

0.0051

0.0060

0.0070

0.0084

0.0100

0.0121

0.0147

0.0184

0.0236

0.0301

0.0382

0.0468

0.0565

0.0678

0.0813

0.0981

0.1201

0.1548

0.1974

0.2397

0.2929

0.3588

0.4420

0.5539

0.6352

0.6998

0.7644

0.8315

0.8910

0.9464

1.0052

1.0696

1.1331

1.1918

1.2000

Qv =

0 0 0

0.0001 0.0000 0.0000

0.0005 0.0000 0.0000

0.0025 0.0000 0.0000

0.0125 0.0000 0.0000

0.0624 0.0001 0.0000

0.3110 0.0015 0.0000

0.6002 0.0054 0.0000

0.9951 0.0151 0.0001

1.3895 0.0295 0.0002

1.7836 0.0489 0.0004

2.1774 0.0734 0.0007

2.5709 0.1029 0.0012

2.9863 0.1396 0.0019

3.4698 0.1899 0.0030

4.0332 0.2587 0.0047

4.6905 0.3534 0.0076

5.4586 0.4843 0.0122

6.3583 0.6665 0.0198

7.4160 0.9221 0.0323

8.6662 1.2851 0.0534

10.1571 1.8101 0.0899

11.9641 2.5916 0.1554

14.2310 3.8209 0.2812

17.1263 5.8507 0.5406

20.2320 8.7057 0.9971

23.4309 12.5386 1.7531

26.2284 16.8014 2.7600

28.8465 21.7231 4.1144

31.3276 27.3694 5.8927

33.7147 33.8301 8.1864

36.0633 41.2461 11.1139

38.4757 49.9383 14.8776

41.2950 61.2306 20.1683

43.7265 71.7776 25.4032

45.4330 79.4186 29.3249

46.9336 86.1721 32.8225

48.1298 91.5677 35.6231

49.0052 95.5126 37.6715

49.5829 98.1339 39.0230

49.7823 98.9741 39.4951

49.8536 99.3962 39.6497

49.9257 99.5913 39.8365

49.9322 99.8065 39.8253

49.9825 99.8158 39.9741

49.9676 99.9269 39.9137

49.9956 99.9147 39.9989

49.9790 99.9899 39.9388

50.0098 99.9406 40.0378

49.9830 100.0159 39.9471

49.9871 100.0077 39.9605

