EE5393 HW#3

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Problem 1

(a)



Pr(C1)=0.1186

Pr(C2)=0.7467

Pr(C3)=0.1347

(b)



Pr[X1=1]=0.0031

Pr[X1=2]=0.0046

Pr[X1=3]=0.1872

Pr[X1=4]=0.1697

Pr[X1=5]=0.0007

Pr[X1=6]=0.1402

Pr[X1=7]=0.3964

Pr[X1=8]=0.0000

Pr[X1=9]=0.0028

Pr[X1=10]=0.0938

Pr[X1=11]=0.0000

Pr[X1=12]=0.0000

Pr[X1=13]=0.0009

Pr[X1=14]=0.0005

Pr[X1=15]=0.0000

Pr[X1=16]=0.0000

Pr[X1=17]=0.0001

Pr[X1=18]=0.0000



Pr[X2=1]=0.0000

Pr[X2=2]=0.0045

Pr[X2=3]=0.0000

Pr[X2=4]=0.0000

Pr[X2=5]=0.0000

Pr[X2=6]=0.2391

Pr[X2=7]=0.0000

Pr[X2=8]=0.0000

Pr[X2=9]=0.0000

Pr[X2=10]=0.5836

Pr[X2=11]=0.0000

Pr[X2=12]=0.0000

Pr[X2=13]=0.0000

Pr[X2=14]=0.1697

Pr[X2=15]=0.0000

Pr[X2=16]=0.0000

Pr[X2=17]=0.0000

Pr[X2=18]=0.0031



Pr[X3=1]=0.0005

Pr[X3=2]=0.0001

Pr[X3=3]=0.0031

Pr[X3=4]=0.1697

Pr[X3=5]=0.3964

Pr[X3=6]=0.0938

Pr[X3=7]=0.0009

Pr[X3=8]=0.0000

Pr[X3=9]=0.0000

Pr[X3=10]=0.1872

Pr[X3=11]=0.1402

Pr[X3=12]=0.0028

Pr[X3=13]=0.0000

Pr[X3=14]=0.0000

Pr[X3=15]=0.0000

Pr[X3=16]=0.0046

Pr[X3=17]=0.0007

Pr[X3=18]=0.0000



The mean and variance of the distribution of X1,2,and 3 as follows.

>> mean(finalS)

ans =

4.8679 8.7244 5.7424

>> std(finalS).^2

ans =

4.4551 6.9567 7.6728

Problem 2

Function 1:

Reactions:

The last 4 function are computing

The first 6 function are computing

Simulation result: using initial condition X0=3, Y0=4

The final result Y=6

% [a'b'c'y y'w a x x'z]

S0=[0,1,0,4,0,0,0,3,0,0];



The final result has a main peak at Z=6

Function 2:

Reactions:

a

The last 6 function are computing

The first 4 function are computing

Simulation result: using initial condition X0=4

The final result Y=4

% [a'b'c'x x'z a y y']

S0=[0,1,0,4,0,0,0,1,0];



The final result has a main peak at y=4

Problem 3:

%these first 4 reaction make 2 copy of a1,b1,a2,b2

%these 4 reaction compute c1=a11\*b11=a1\*b1

%these 4 reaction compute c2=a12\*b21=a1\*b2

%these 4 reaction compute c2=a21\*b12=a2\*b1

%these 4 reaction compute c2=a22\*b22=a2\*b2

Take the inverse of both side.

We can set whatever coefficient in front of C1 and C2, I choose that to be 1, then

Simulation I choose A1=1, A2=2, B1=3, B2=4



Problem 4

1. GCD

Reaction :

%these reaction z=x-y or z=y-x

%these 2 reactions are when x absence change difference z to x’ or when y absence change z to y’

%these 2 reactions are intermedium material change back to x or y

%these 3 reactions are absence indicator xbar of x

%these 3 reactions are absence indicator ybar of y

Simulation :

X and Y as two operand start with X=66, Y=30

GCD for 66 and 30 is 6

% [x,xp,xbar,y,yp,ypbar,z]

S0=[66,0,0,30,0,0,0];





After some time X and Y end with 0 and 6.

1. Collatz

Reactions:

%this reaction will fire when is larger than 1 and also need absence indicator ybar this means the last reaction of last iteration finish, and produce an indicator C that mark this reaction happen.

%these reaction is dealing with the case that x is odd, there is a remaining x after first reaction fire. And this reaction will only fire when the first reaction happens, this guarantee that when x=1 it would stop won’t go 1-4-2-1-4-2-1 and repeating.

%C is the indicator of first reaction happen, decay each iteration.

%the product of second reaction x’ is the indicator of x is odd, x’ will change all b to y and these b are 3x-3(since the last one x does not go into first reaction), and x’ itself change to 4 y thus the total y will be 3x+1

%when x is even y will be y will be x\*6/2/6=0.5x

%y will slow change back to x

%these 3 reactions are absence indicator ybar of y

Simulation result using x start with 27:

xPeak =

Columns 1 through 6

27 82 41 124 62 31

1 189 355 641 891 1017

Columns 7 through 12

94 47 142 71 214 107

1233 1423 1751 2037 2533 2963

Columns 13 through 18

322 161 484 242 121 364

3711 4357 5483 6453 6939 7785

Columns 19 through 24

182 91 274 137 412 206

8515 8881 9517 10067 11025 11851

Columns 25 through 30

103 310 155 466 233 700

12265 12985 13607 14691 15625 17255

Columns 31 through 36

350 175 526 263 790 395

18657 19359 20583 21637 23477 25059

Columns 37 through 42

1186 593 1780 890 445 1336

27823 30197 34347 37909 39691 42805

Columns 43 through 48

668 334 167 502 251 754

45479 46817 47487 48655 49661 51417

Columns 49 through 54

377 1132 566 283 850 425

52927 55565 57831 58965 60945 62647

Columns 55 through 60

1276 638 319 958 479 1438

65621 68175 69453 71685 73603 76955

Columns 61 through 66

719 2158 1079 3238 1619 4858

79833 84865 89183 96735 103213 114545

Columns 67 through 72

2429 7288 3644 1822 911 2734

124263 141265 155843 163133 166779 173155

Columns 73 through 78

1367 4102 2051 6154 3077 9232

178625 188194 196400 210756 223066 244604

Columns 79 through 84

4616 2308 1154 577 1732 866

263070 272304 276922 279232 283270 286736

Columns 85 through 90

433 1300 650 325 976 488

288470 291500 294102 295404 297678 299632

Columns 91 through 96

244 122 61 184 92 46

300610 301100 301346 301772 302142 302328

Columns 97 through 102

23 70 35 106 53 160

302422 302582 302724 302968 303182 303552

Columns 103 through 108

80 40 20 10 5 16

303874 304036 304118 304160 304182 304216

Columns 109 through 112

8 4 2 1

304250 304268 304278 304284



To see specific detail of this figure, see uploaded code.