%part b

%Initialization

%Assume that the oasis only open for 3 hours. After 3 hours, the customer

%cannot enter the reastaurant.

%Assume that there are 200 customers on average come to Oasis

lambda1=200;

%Assume that the service time at every service window have exponential distribution with mean=1/60

lambda2=1/60;

%Assume that the service time at every catering window have exponential distribution with mean=5/60

lambda3=2.5/60;

%Assume that customers will choose the service window and catering window with the same probability.

t=0;

n1=zeros(1,9);%the number of customer at the ith service window

t1=zeros(1,9);%the arrival time that the customer arrive in the service window

N1=zeros(1,9);%the total number of customer at the ith service window

n2=zeros(1,8);%the number of customer at the ith catering window

t2=ones(1,8)\*inf;%the arrival time that the customer arrive in the catering window

N2=zeros(1,8);%the total number of customer at the ith service window

N\_A=0; %the arrival time

T=3;%Simulate the lunch 3h time

tA=0;

A1=zeros(9,100);%record the departure time of the service window

A2=zeros(8,100);%record the departure time of the catering window

A0=zeros(9,100);%record the arrival time of the service window

A=[];%record the arrival time at which service window the customer choose to go to

Choice2=zeros(8,100);

Choice1=[];

%Simulate the arrival time of the customers and its choice for what to eat whithin 3hours

while(tA<=3)

tA=tA+exprnd(1/lambda1);

A=[A,tA];

end

N\_A=size(A,2);

%Deal with its service time and departure time

for i=1:N\_A

%service window

choice1=choice\_service(n1);

N1(choice1)=N1(choice1)+1;

n1(choice1)=n1(choice1)+1;

A0(choice1,N1(choice1))=A(i);

Choice1(i)=choice1;

%Determine the start time of the service through

%max(A(i),A1(choice1,N1(choice)-1).

if(A1(choice1,1)==0) % the first people in the queue (special case)

t1(choice1)= A(i)+exprnd(lambda2);

n1(choice1)=0;

elseif(A(i)>=A1(choice1,N1(choice1)-1)) %no one

t1(choice1)= A(i)+exprnd(lambda2);

n1(choice1)=0;

else % have one people having service

t1(choice1)= A1(choice1,N1(choice1)-1)+exprnd(lambda2);

n1(choice1)=n1(choice1)-1;

end

A1(choice1,N1(choice1))=t1(choice1);

Choice2(choice1,N1(choice1))=randi(8);

end

C=zeros(8,100);

%Separately deal with the customers in catering window from 1 to 8

for j=1:8

%extract the departure time of the service window who choice to go to catering window j.

%B1 is the arrival time which is similar to A1

[a1,b1]=find(Choice2==j);

B1=[];

for n=1:size(a1)

B1=[B1,A1(a1(n),b1(n))];

end

B1=sort(B1);

C(j,1:size(B1,2))=B1;

N2(j)=size(B1,2);

for m=1:N2(j)

if(m==1)

t2(j)=B1(m)+exprnd(lambda3);

elseif(B1(m)>=A2(j,m-1)) %no one

t2(j)=B1(m)+exprnd(lambda3);

else %have one people having service

t2(j)=A2(j,m-1)+exprnd(lambda3);

end

A2(j,m)=t2(j);

end

end

%Waiting time for the service window

W1=A1-A0;

mean(W1,2)

mean(mean(W1,2))

%Waiting time for the catering window

W2=A2-C;

mean(W2,2)

mean(mean(W2,2))

end

function [m] = choice\_service(n1)

%Simulate the process of customer ordering the food

%The customer will choose the service window where there is smallest number

%of people

c=find(n1==min(n1));

if(size(c)==1)

m=c;

else

m=randsample(c,1,true);

end

end