Homework #3 Matlab Code:

Problem #1

(b)

for k=1:20

% Number of simulations

T = 30;

%initial values of the population

S0 = 29;

I0 = 1;

R0 = 0;

% parameters

p = 0.05;

indexoftimeT = T +1;

% values of the susceptible population will be stored in S

S = zeros (1, indexoftimeT);

S(1) = S0;

% values of the infected population will be stored in I

I = zeros (1, indexoftimeT);

I(1) = I0;

% values of the recovered population will be stored in R

R = zeros (1, indexoftimeT);

R(1) = R0;

% values of the binomially distributed random variables through each

% timestep

N = 30;

% establish a for loop to develop new values in each time step

for n = 2:indexoftimeT

Y = n;

X(n) = binornd(S(n-1), (1-(1-p)^I(n-1)));

S(n) = S(n-1)-X(n);

I(n) = X(n);

R(n) = R(n-1)+I(n-1);

if I(n) == 0

break

end

end

for j = Y:indexoftimeT

S(j) = S(Y-1);

R(j) = R(Y-1);

I(j) = 0;

end

h=figure;

plot(0:T, S,'--', 0:T, I, ':', 0:T, R, '+')

saveas(h,sprintf('FIG%d.png',k)); % will create FIG1, FIG2,...

end

(c)

for h = 1:20

%define the total vector space for the complete number of simulations

Total = zeros(1,2000);

% Number of simulations

T = 30;

%initial values of the population

S0 = 29;

I0 = 1;

R0 = 0;

% parameters

p = 0.05;

indexoftimeT = T +1;

% values of the susceptible population will be stored in S

S = zeros (1, indexoftimeT);

S(1) = S0;

% values of the infected population will be stored in I

I = zeros (1, indexoftimeT);

I(1) = I0;

% values of the recovered population will be stored in R

R = zeros (1, indexoftimeT);

R(1) = R0;

% values of the binomially distributed random variables through each

% timestep

N = 30;

for k = 1:2000

% establish a for loop to develop new values in each time step

for n = 2:indexoftimeT

Y = n;

X(n) = binornd(S(n-1), (1-(1-p)^I(n-1)));

S(n) = S(n-1)-X(n);

I(n) = X(n);

R(n) = R(n-1)+I(n-1);

if I(n) == 0

break

end

end

for j = Y:indexoftimeT

S(j) = S(Y-1);

R(j) = R(Y-1);

I(j) = 0;

end

Total(k)=R(j);

end

binranges = 0:indexoftimeT;

[bincounts] = histc(Total,binranges);

g=figure;

bar(binranges,bincounts,'histc')

saveas(g,sprintf('BARPLOT%d.png',h));