Part c

```
N=200;
iterations = 1000;
F = [0.5, 0.5, 0; 0, 0.5, 0.5; 0, 0, 0.5];
H = [1, 1, 1];
Q = [1, 0, 0; 0, 1, 0; 0, 0, 1];
R = 1;
epsilon = zeros(3,1,1000);
Pt = zeros(3,3,1000); %true P
I = eye(3,3);
for k = 1:iterations
P = I;
xtrue = zeros(3, 200, iterations);
xtrue(:, 1) = 0;

z = zeros(200, 1)
z(1) = H*xtrue(:,1)+ randn;
xhat = zeros(3, 200);
xhat(:,1) = xtrue(:, 1);

for i = 2:N
w = mvnrnd([0 0 0], Q);
v = randn;
x(:,k) = F*x(k-1)+w';
z(k) = H*x(:,k) + v;
P = F*P*F' + Q;                                  %Error Covariance update
K = P*H'/(H*P*H' + R);                           %Gain matrix
xhat(:, k) = xhat(:, k) + K*(z(k) - H*xhat(:,k)); %update for estimate at time k
P = (I3 - K*H)*P;
endepsilon(:,:,k) = xhat(:,200) - xtrue(:,:,200);
Pt(:,:,k)=P;
end

Pest = zeros(3,3,1000);
for j = 1:iterations
Pest(:,:,j) = epsilon(:,:,j)*epsilon(:,:,j)';
end
Pest = mean(Pest, 3);

trace(Pest);  %trace of sample P
trace(Pt);   %trace of true P

%trace(Pest) < trace(Pt), therefore, KF is performing as expected!!
```