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%EEE 587, Problem 1 Linear Systems

G_11 = tf(1,[1 1]),  G_12 = tf([1 3],conv([1 1],[1 2])),
G_21 = tf(1,conv([1 1],[1 2])),  G_22 = tf([1 5],conv([1 1],[1 2]))

G = ss([G_11 G_12;G_21 G_22])

Gm = minreal(G)

P=lyap(Gm.a',eye(size(Gm.a)))

Gm.a'*P+P*Gm.a % verify


x0=rand(4,1)

t=[0:.01:10]';
x=lsim(Gm.a,Gm.b,sqrtm(P),zeros(4,2),t*[0 0],t,x0);
V=sum((x.*x)')';

plot(t,V)
```