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% Matt McDade
% System Simulation
% Final Exam Problem 2B

clear; close all; clc;

s = 77.27;
w = 0.1610;
q = 8.375E-6;
e = 1;

x1 = 1;
x2 = 10000;
x3 = 1000;
A = [s*(-x2 + 1 - 2*q*x1), s*(1-x1), 0;
     -x2/s, (-1-x1)/s, e/s;
     w, 0, -w];
eigA = eig(A)
srA = max(abs(eigA)) / min(abs(eigA))

x1 = 31623;
x2 = 10;
x3 = 100000;
B = [s*(-x2 + 1 - 2*q*x1), s*(1-x1), 0;
     -x2/s, (-1-x1)/s, e/s;
     w, 0, -w];
eigB = eig(B)
srB = max(abs(eigB)) / min(abs(eigB))

x1 = 1;
x2 = 1;
x3 = 1;
C = [s*(-x2 + 1 - 2*q*x1), s*(1-x1), 0;
     -x2/s, (-1-x1)/s, e/s;
     w, 0, -w];
eigC = eig(C)
srC = max(abs(eigC)) / min(abs(eigC))

x1 = 488.68;
x2 = 0.99796;
x3 = 488.68;
Eq = [s*(-x2 + 1 - 2*q*x1), s*(1-x1), 0;
     -x2/s, (-1-x1)/s, e/s;
     w, 0, -w];
eigEq = eig(Eq)
srEq = (max(abs(eigEq))) / (min(abs(eigEq)))

eigA =
    -0.0258832664682283
         -0.161
    -772622.731294272
srA =

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eigB =      29850279.2235542
      -1158.45042233271
      12.4776596777347
      0.186773991847587
srB =
      6202.41828572169
eigC =
      -0.0258832664682283
           -0.161
           -0.0012942725
srC =
      124.394206011485
eigEq =
      -25.7297632355497
      18.7553140843511
      0.00133590381764301
srEq =
      19260.1914117933
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