EGB345 Control and Dynamic Systems JJF/21

**Servo Motor System Identification Report**

Instructions: replace the yellow highlighted text with your own words and the requested plots (that is, delete the yellow text). Note the submitted must be saved from MATLAB (not screen captures).

Authorship details

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| List others providing assistance |  |

Text and plot answers

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| Question 1 [Text] | Km = 6.492375690272647  Alpha = 4.608909558955339 |
| Question 2 [Text] | K\_est = 6.510000000000000  alpha\_est = 4.620000000000000  Km estimate has an error of 0.27%  The alpha estimate has an error of 0.24% |
| Question 1 [Plot] | Chart, line chart  Description automatically generated |
| Question 2 [Plot] | Chart, line chart  Description automatically generated |
| Question 2  [MATLAB] | function [alpha\_est,K\_est]=estmotor(t,ydata)    % Using for loops  oldCost = 1e100;  % Estimaton for 1 sf  for i = 1:1:14  for j = 0:1:10      %set up tf function  numTest = [i];  denTest = [1 j 0];  sys = tf(numTest,denTest);    %response to a step input  SEA\_TF = 2\*step(sys,t);    %cost -> Square Sum Error  cost = sse(ydata-SEA\_TF);    if cost<oldCost  num = [i];  den = [1 j 0];  oldCost = cost;  end  end  end    num1sig = num;  den1sig = den(2);    % Estimaton for 2 sf  for k = num1sig -3 :0.1:num1sig+3  for l = den1sig - 4:0.1:den1sig +4      %set up tf function  numTest = [k];  denTest = [1 l 0];  sys = tf(numTest,denTest);    %response to a step input  SEA\_TF = 2\*step(sys,t);    %cost -> Square Sum Error  cost = sse(ydata-SEA\_TF);    if cost<oldCost  num2 = [k];  den2 = [1 l 0];  oldCost = cost;  end  end  end    num2sig = num2;  den2sig = den2(2);    % Estimaton for 3 sf  for m = num2sig-.1:0.01:num2sig+.1  for n = den2sig - .1:0.01:den2sig +.1      %set up tf function  numTest = [m];  denTest = [1 n 0];  sys = tf(numTest,denTest);    %response to a step input  SEA\_TF = 2\*step(sys,t);    %cost -> Square Sum Error  cost = sse(ydata-SEA\_TF);    if cost<oldCost  num3 = [m];  den3 = [1 n 0];  oldCost = cost;  end  end  end    disp('done');    K\_est = num3    alpha\_est = den3(2)    end |
| Question 3 [Text] | To 3 significant figures:  alpha\_est\_1 = 4.27  K\_est\_1 = 7.09 |
| Question 3 [Plot] | Chart, line chart  Description automatically generated |
| Question 3 [Text] | The accuracy of the randomly generated data produced a good estimate with only a 0.27% error maximum. It can therefore be inferred that the model for q3 will produce an accurate model and will have a very low error. |

**Approved Extension Letter**

Text

Description automatically generated