

ControlHomeworkVII-2019

Construct an empirical 1st order model for the following data,

Time	$c(t)$
0	0
0.2000	0.1735
0.4000	0.4145
0.6000	0.6012
0.8000	0.7314
1.0000	0.8197
1.2000	0.8791
1.4000	0.9189
1.6000	0.9457
1.8000	0.9636
2.0000	0.9756
2.2000	0.9836
2.4000	0.9890
2.6000	0.9926
2.8000	0.9951
3.0000	0.9967
3.2000	0.9978
3.4000	0.9985
3.6000	0.9990
3.8000	0.9993
4.0000	0.9996
4.2000	0.9997
4.4000	0.9998
4.6000	0.9999
4.8000	0.9999
5.0000	0.9999

Using,

- 1) For unit step input,

$$G(s) = \frac{C(s)}{R(s)} = \frac{C(s)}{\frac{1}{s}} = sC(s)$$

Assume $c(t)$ takes the form,

$$c(t) = c_{ss} + K_1 e^{-at} + K_2 e^{-bt} + \dots$$

where c_{ss} is the final-value of $c(t)$;

- 2) Approximate using first-order-plus-time-delay model;
- 3) Sundaesan and Krishnaswamy's method.