Lab 7

EE 324: Signals and Systems II

We will utilize z transformation to analyze several more discrete time dynamical systems.

1 Prelab assignment

1. Derive the transfer function of the system

$$y[k] - 1.3y[k-1] + 0.4y[k-2] = x[k].$$
(1)

2. Derive the transfer function of the system

$$y[k] - 1.8y[k-1] = c[k] + x[k]$$
 (2a)

$$c[k] = \alpha y[k-1] \tag{2b}$$

with input x and output y.

2 Lab assignment

1. Realize system (1) through transfer function block.

- 2. Realize system (1) through cascade connection of two first order systems.
- 3. Realize system (1) through parallel connection of two first order systems.
- 4. Compare the responses of 1 to 3 with input x[k] = 1, $x[k] = 1.5^k$ and $x[k] = 3^k$.

5. Realize system (2) through feedback connection.

6. Simulate the impulse response and the step response for three sets of parameters:

i) $\alpha = 0$

ii)
$$\alpha = 1$$

iii) $\alpha = -1$

with zero initial conditions. Discuss your observation.