

Instructions

1. Read Chapters 7 and 8.

Chapter 7

Homogeneous Difference Equations

1. **Problem 7.32.** Use the techniques of this chapter to find the solution of the following difference equation

$$y(n) + \frac{5}{6}y(n-1) - \frac{1}{6}y(n-2) = \left(\frac{1}{2}\right)^n u(n), \quad y(-2) = 0, \quad y(-1) = 0, \quad n \geq 0$$

Chapter 8

Solving Difference Equations

2. **Problem 8.46.** Consider the causal system

$$y(n) = \frac{3}{4}y(n-1) - \frac{1}{8}y(n-2) + x(n)$$

- (a) Find the modes of the system.
- (b) Find all solutions to the homogeneous solution.
- (c) Find particular solutions when
 - (c.1) $x(n) = u(n)$
 - (c.2) $x(n) = (\frac{1}{3})^n u(n)$
- (d) Find the complete solution in each of the above cases.
- (e) Find the impulse response $h(n)$ of the relaxed system. Is the relaxed system BIBO stable?

3. **Problem 8.48.** A causal system is described by the difference equation

$$y(n) - \frac{1}{2}y(n-1) = x^2(n), \quad n \geq 0$$

with initial condition $y(-1) = 2$, and where $x(n)$ denotes the input sequence.

- (a) Draw a block diagram representation for the system.
- (b) Find the zero-input response of the system.
- (c) Find the zero-state response of the system corresponding to $x(n) = (\frac{1}{2})^n u(n-1)$
- (d) Find the complete response of the system. Verify that your solution satisfies the initial condition and the difference equation.