UNIVERSITY OF CALIFORNIA, RIVERSIDE
Department of Electrical Engineering

WINTER 2025

EE110B-SIGNALS AND SYSTEMS

HOMEWORK 3

Please turn in before Friday, January 31st, 2025, 11:59PM.

Problem 1: Consider a causal LTI system with the input-output relationship given by the difference equation

$$y[n] = 0.64y[n-2] + x[n] \ .$$

a) Find the output of the system for the input $x[n] = u[n]$ by directly solving the difference equation. Recall that the solution can be broken into the homogeneous solution $y_h[n]$ and the particular solution $y_p[n]$. For the particular solution, since we are only interested in $n \geq 0$, you can take the input as $x[n] = 1$ and use the *educated* guess $y_p[n] = K$. Finally, the unknown coefficients in $y[n] = y_h[n] + y_p[n]$ must be determined by $y[0]$ and $y[1]$, which you need to extract from $y[n] = 0.64y[n-2] + u[n]$ and $y[n] = 0$ for $n < 0$.

b) Find the impulse response $h[n]$ of this system. Recall that you need to

1. realize that $h[n] = 0$ for $n < 0$ since the system is causal,
2. find $h[0]$ and $h[1]$,
3. for $n \geq 2$, use the fact that $\delta[n] = 0$ and just solve the homogeneous equation $h[n] = 0.64h[n-2]$ (you can borrow the homogeneous solution from part a),
4. use the initial conditions $h[0]$ and $h[1]$ to figure out the unknown coefficients of the homogeneous solution.

c) For the same input $x[n] = u[n]$, find the output using convolution $y[n] = h[n] \star x[n]$. Did you get the same output as in part a?