

Homework No. 3
Due 16:20 pm, Nov 3, 2016

1. Consider a linear constant-coefficient difference equation with initial conditions given below.

$$y[n] - \frac{1}{4}y[n-1] - \frac{1}{8}y[n-2] = x[n] + x[n-1], \quad y[-1] = 1, \quad y[-2] = 0.$$

Determine the homogeneous, particular, and complete solutions for each of the following cases:

(a) $x[n] = \left(\frac{1}{8}\right)^n u[n]$; (b) $x[n] = e^{j\frac{\pi}{4}n} u[n]$.

2. Consider a system whose input $x(t)$ and output $y(t)$ satisfy the following linear constant-coefficient differential equation:

$$\frac{d^2 y(t)}{dt^2} + 5 \frac{dy(t)}{dt} + 6y(t) = x(t).$$

- (a) Determine the output $y(t)$ when the system is with input $x(t) = [e^{-t} + e^{-2t}]u(t)$ and initial conditions $y(t)|_{t=0^-} = 1$ and $\frac{dy(t)}{dt}\bigg|_{t=0^-} = 0$.
- (b) Determine the natural response of the system with initial conditions given above.
- (c) Determine the forced response of the system.