

Digital Signal Processing Assignment # 12

1. A discrete-time LTI system has the following difference equation.

$$y(n) = \frac{5}{6}y(n-1) - \frac{1}{6}y(n-2) + \frac{1}{4}x(n) + \frac{1}{2}x(n-1) \quad (1)$$

- (a) Find the transfer function $H(z)$.
 - (b) Find the frequency response $H(\Omega)$, and plot with Matlab the amplitude and phase response.
 - (c) Find the impulse response.
 - (d) Plot the direct-form I, direct-form II, transposed direct-form II structure of the system.
 - (e) Is the system stable?
2. A discrete-time LTI system has the impulse response $h(n) = [2, -1, 3, -1, 2]$.
- (a) Find the transfer function $H(z)$.
 - (b) Find the frequency response $H(\Omega)$, and plot with Matlab the amplitude and phase response.
 - (c) Find the difference equation representation.
 - (d) Plot the direct-form structure of the system.
 - (e) Is the system stable?

3. The transfer function of a LTI system is given as follows.

$$H(z) = \frac{1 - z^{-1} + \frac{1}{3}z^{-2}}{1 - \frac{1}{2}z^{-2}} \quad (2)$$

- (a) Find the difference equation.
- (b) Plot the direct-form II structure of the system.
- (c) Is the system stable?