

6. The following discrete-time signal:

$$x[n] = \left\{ \underset{\uparrow}{2}, 0, 1 \right\}$$

is passed through a linear time-invariant (LTI) system described by the difference equation:

$$y[n] + \frac{1}{2}y[n-2] = x[n] - \frac{1}{4}x[n-2]$$

Answer each of the following questions:

- (a) Write out an expression for the frequency response of the system, i.e. $H(e^{j\omega})$.
 - (b) Write out an expression for Discrete-Time Fourier Transform (DTFT) of the input $x[n]$.
 - (c) Write out an expression for the DTFT of the output $y[n]$.
 - (d) Determine the output sequence $y[n]$.
7. The following discrete-time signal:

$$x[n] = \left\{ \underset{\uparrow}{0}, 2, 0, 4 \right\}$$

is passed through a linear time-invariant (LTI) system described by the difference equation:

$$y[n] = b_0x[n] + b_1x[n-1] + b_2x[n-2] - a_1y[n-1] - a_2y[n-2]$$

The output of the system is the discrete-time signal:

$$y[n] = \left\{ \underset{\uparrow}{0}, 0, 10, 8 \right\}$$

Answer each of the following questions:

- (a) Write out an expression for the Discrete-Time Fourier Transform (DTFT) of the input $x[n]$.
- (b) Write out an expression for the Discrete-Time Fourier Transform (DTFT) of the output $y[n]$.
- (c) Determine the numerical values of the difference equation coefficients $\{b_0, b_1, b_2, a_1, a_2\}$.