Digital Signal Processing Assignment # 5

1. Find the inverse Z-transforms of the following signals.

   (a) $X(z) = \dfrac{1 + \frac{1}{2}z^{-1}}{1 - \frac{3}{4}z^{-1} + \frac{1}{8}z^{-2}}$

   (b) $X(z) = \dfrac{\left(z + \frac{1}{2}\right)\left(z + \frac{1}{4}\right)}{\left(z - \frac{3}{8}\right)\left(z - \frac{1}{4}\right)}$.

   (c) $X(z) = \dfrac{z(z+2)}{z^2 + 4z + 6}$

2. Use Z-transforms to find the convolution of the following causal sequences.

   (a) $x(n) = \left(\frac{1}{2}\right)^{n-1} u(n-1)$, $h(n) = \left(\frac{1}{3}\right)^{n-1} u(n)$

   (b) $x(n) = [1, -1, 2, -1]$, $h(n) = [1, 0, -2, 3]$.

3. An LTI system with transfer function given as follows

$$H(z) = \frac{z - 2}{z^2 + 4z + 3} \tag{1}$$

   (a) Find the step response of the system.

   (b) Represent the system in the form of a difference equation.

   (c) Is the system stable?

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