İstatistiksel İşaret İşleme Ödev – 4

1. Find the Padé approximation of second order to a signal $x(n)$ given by

$$\mathbf{x} = [2, 1, 0, -1, 0, 1, 0, -1, 0, 1, \cdots]^T$$

I,e, $x(0) = 2, x(1) = 1, x(2) = 0$, and so on. On other words, using an approximation of the form

$$H(z) = \frac{b(0) + b(1)z^{-1} + b(2)z^{-2}}{1 + a(1)z^{-1} + a(2)z^{-2}}$$

find the coefficients $b(0)$, $b(1)$, $b(2)$, $a(1)$, and $a(2)$.

2. A third-order all-pole Padé approximation to a signal $x(n)$ has been found to be

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

What information about $x(n)$ can be determined from this model?

3. A consumer electronics device includes a DSP chip that contains a linear shift invariant digital filter that is implemented in ROM. In order to perform some reverse engineering on the product, it is necessary to determine the system function of the filter. Therefore, the unit sample response is measured and its determined that the first eight values of $h(n)$ are as listed in the following table.

	Unit Sample Response							
n	0	1	2	3	4	5	6	7
$h(n)$	-1	2	3	2	1	2	0	1

Having no knowledge on the order of the filter, it is assumed that $H(z)$ contains two poles and two zeros.

(a) Based on this assumption, determine a candidate system function $H(z)$, for the filter.
(b) Based on the solution found in (a) and given the values of $h(n)$, is it possible to determine whether or not the hypothesis about the order of the system is correct? Explain.