PROBLEM 3.1:
(3 points) Consider a system $S$ with the following input-output relationship:

$$y(n) = \frac{1}{6}x(2n) - \frac{1}{3}x(n + 1) - \frac{1}{4}x(n - 3)$$

Consider the following input:

$$x(n) = \begin{cases} 
0.75, & n = 0 \\
0.5, & n = 2 \\
0.25, & n = 3 \\
0, & \text{otherwise}
\end{cases}$$

(a) Compute the output of the system at $n = 1$, $y(1)$.

(b) Express $y(1)$ in 2’s complement Q4 format and determine the resulting error.

PROBLEM 3.2:

(a) Let $x = 11011$ and $y = 10110$ in 2’s complement representation. Compute the product $p = x \times y$ using Booth’s algorithm. Show the steps indicating how the partial products are formed.

(b) (3 points) Let $X = 00101$ and $D = 011$ be two fractional 2’s complement binary numbers in Q4 and Q2 formats, respectively. Compute the division $X/D$ using the sequential division algorithm. Show the performed steps and determine the resulting quotient $Q$ and remainder $R$. 

Reading: Read Sections 2.4, 2.5, 3.2.4, 3.2.5, and 3.3 in Kuo, Lee & Tian.

Announcement: Exam 1 will be held after Spring Break on Thursday 15 March during class time. Exam 1 will cover the material, reading, and problems assigned in homeworks 1, 2 and 3, and class lecture notes up and including Division and integer arithmetics. Exam 1 will be closed book and closed notes. Only one $8\frac{1}{2} \times 11$ page of handwritten notes is allowed. No calculators and no other devices are allowed, except for a pencil, pen, eraser, and ruler.