UNIVERSITY OF BUEA
MID-SEMESTER EXAMINATION

MONTH: May
YEAR: 2013
DATE: 28/05/2014
INSTRUCTION: Answer ALL questions

COURSE INSTRUCTOR: SONE EKONDE
COURSE TITLE: Digital Signal Processing
TIME ALLOWED: 2 HOURS

QUESTION 1

A) A second-order recursive system *is* described by the difference equation

$$y(n) = 3/4\, y(n-1) - 1/8\, y(n-2) + x(n) - x(n-1)$$

   i) Represent the system with a block diagram   **(3 marks)**
   ii) Determine whether the system is causal   **(2 marks)**

B) Find the convolution of the two finite-length sequences:
   i)
           $x(n) = 0.5n\,[u(n) - u(n-6)]$ and
        $h(n) = 2\sin(n\pi/2)\,[u(n+3) - u(n-4)]$
   ii)

$$x(n) = \begin{cases} 1 & n = 0,1,2 \\ 0 & \text{otherwise} \end{cases} \quad \text{and} \quad h(n) = \begin{cases} 0 & n = 0 \\ 1 & n = 1,2 \\ 0 & \text{otherwise} \end{cases}$$

                                                   (8 marks)

C) Use the z-transform to perform the convolution of the following two sequences:
   i) $h(n) = \begin{cases} \left(\frac{1}{2}\right)^n & 0 \le n \le 2 \\ 0 & \text{else} \end{cases}$

       $x(n) = \delta(n) + \delta(n-1) + 4\,\delta(n-2)$

   ii) $h(n) = (0.5)^n\, u(n)$ and $x(n) = 3^n\, u(-n)$
                                                  (6 marks)

QUESTION 2

A) Find the z-transform of each of the following sequences
   i) $x(n) = (1/2)^n\, u(n+2) + (3)^n\, u(-n-1)$
   ii) $x(n) = 3\,\delta(n) + \delta(n-2) + \delta(n+2)$
                                                   (6 marks)

B) A second-order recursive system *is* described by the difference equation

$$y(n) + 0.1\, y(n-1) - 0.2\, y(n-2) = x(n) + x(n-1)$$

   Use the z-transform to determine the impulse response y[n] due to the impulse
   sequence x[n] = δ[n]
                                                   (5 marks)