

Glasgow College, UESTC

Signals and Systems—Semester 2, 2017 - 2018

Quiz 1

April, 2018

Notice: Please make sure that both your UESTC and UoG Student IDs are written on the top of every sheet. This examination is closed-book and **the use of a cell phone is not permitted**. All scratch paper must be adequately labeled. Unless indicated otherwise, answers must be derived or explained clearly. Please write within the space given below on the answer sheets.

All questions are compulsory. There are **5** questions and a maximum of 100 marks in total.

The following table is for grader only:

Question	1	2	3	4	5	Total	Grader
Score							

Score

Question1 (**5×8=40 points**)

Each of the following questions may have one or two right answers, justify your answers and write it in the blank.

(1) Consider an LTI system whose input $x[n] = [1,2,1], n = 0,1,2$ and output $y[n] = [1,3,3,1], n = -1,0,1,2$. The unit impulse response $h[n]$ of this system is ().

(a) $h[n] = [1,1], n = 0,1$

(b) $h[n] = [1,1], n = -1,0$

(c) $h[n] = [1,1], n = 1,2$

(d) $h[n] = [1,2], n = -1,0$

(2) Determine which one of the following signals has the highest frequency. ()

(a) $\cos[11\pi n/16]$

(b) $\cos[15\pi n/16]$

(c) $\cos[\pi n/2]$

(d) $\cos[2\pi n]$

(3) Determine which of the following systems is not linear system ().

(a) $y(t) = \cos(t+1)x(t)$

(b) $y(t) = e^{t+1}x(t)$

(c) $y(t) = \cos\{(t+1)x(t)\}$

(d) $y(t) = (t+1)^2x(t)$

(4) Determine which of the following system are causal and stable (). In each example, $h(t)$ denotes the impulse response of the following systems.

- (a) $h(t) = e^t[\delta(t-1) + \delta(t-3)]$ (b) $h(t) = (\cos t)e^{0.5t}u(t-2)$
 (c) $h(t) = e^t[\delta(t+1) + \delta(t-1)]$ (d) $h(t) = [\cos(t+2)]e^{-t}u(t+2)$

(5) If the convolution integral $x(t) * e^{-t}u(t) = 1 + e^{2t}$, the signal $x(t)$ must be ().

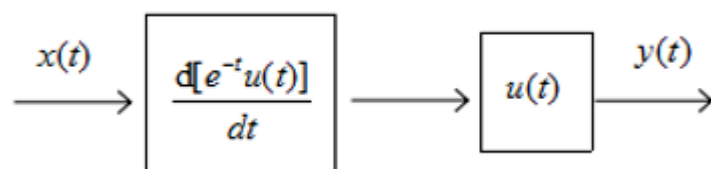
- (a) $1 + 3e^{2t}$ (b) 1 (c) $3e^{2t}$ (d) $(1 + 3e^{2t})u(t)$

(6) We are given a certain system with unit impulse response $h_0[n]$ and $y_0[n] = x_0[n] * h_0[n]$. Determine which of the following statements is true. ()

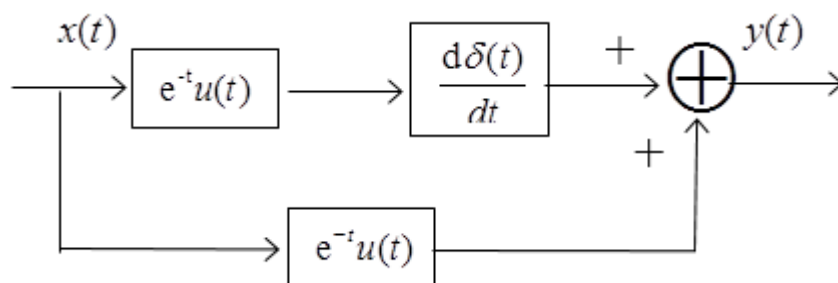
- (a) $y_0[-n] = x_0[-n] * h_0[n]$ (b) $y_0[n] = x_0[n+1] * h_0[n-1]$
 (c) $y_0[2n] = x_0[n] * h_0[2n]$ (d) $y_0[n] = x_0[n/2] * h_0[2n]$

(7) Determine which of the following systems might be identity systems. ()

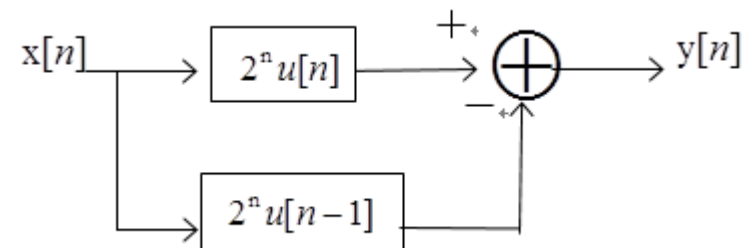
(a)



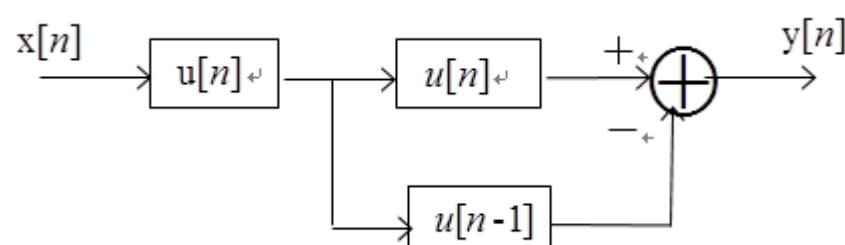
(b)



(c)



(d)



Score

Question2 (15 points)

Determine and sketch the even part of the signal $x(t)$ depicted in Figure 1.

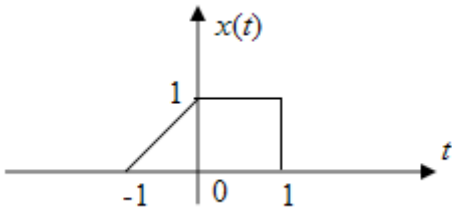


Figure1

Score

Question3 (15points)

Consider an LTI system whose response to the signal $x_1(t)$ in Figure2 is the signal $y_1(t)$ illustrated in Figure 3. If we know that the output signal of this system is $y_2(t)$ depicted in Figure 4, determine and sketch the input signal $x_2(t)$.

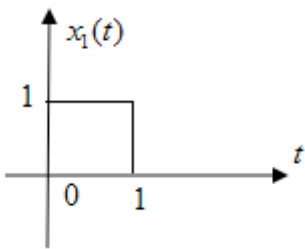


Figure2

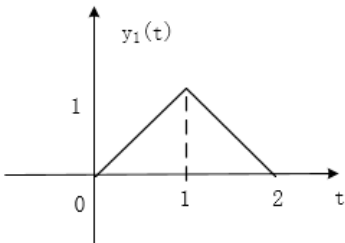


Figure3

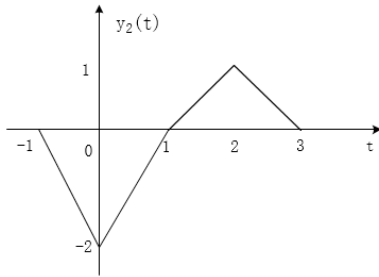


Figure4

Score

Question4 (15 points)

Compute the convolution integral $2e^{2t} * e^{-2t}u(t)$

Score

Question5 (15 points)

A continuous-time signal $x(-3t + 2)$ is illustrated in Figure 2. Determine and sketch the signal $x(t)$.

