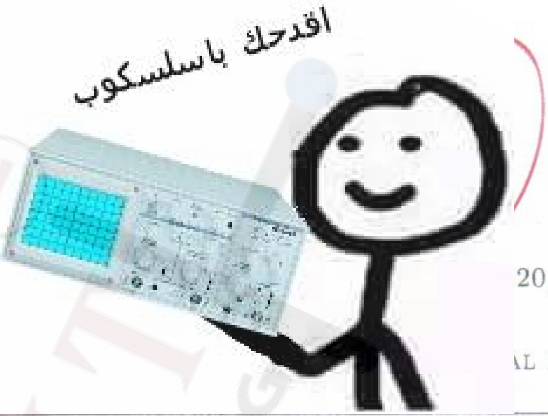
UNIVERSITY
DEPARTMENT OF ELE
SIGNALS A
FIRST EXAM 20 M 20/3/2013



DR. MAHMOUD AL-HUSARI NAME: L NO. 50

٥x١٠ ٢٥

SERIAL NO. ☐

SECTION:
- ☑ SECTION 1, SUN, TUE, THUS 09:00-10:00
- ☐ SECTION 2, SUN, TUE, THUS 11:00-12:00
- ☐ SECTION 3, MON, WED 09:30-11:00

Write your answers here

1	a	2	e	3	e	4	d	5	e	6	e	7	c
8	d	9	a	10	d	11	b	12	e	13	e	14	c
15	c	16	e										

1. The impulse response of the continuous-time cascade system shown is

$$\longrightarrow \boxed{h_1(t) = 3u(t)} \longrightarrow \boxed{h_2(t) = e^{-3t}u(t)} \longrightarrow \boxed{h_3(t) = \delta(t-2)} \longrightarrow$$

   a. $3e^{-6}\delta(t-2)$
   b. $u(t-2) - e^{-3(t-2)}u(t-2)$
   c. none of these
   d. $3u(t) + e^{-3t}u(t) + \delta(t-2)$
   e. $3e^{-3t}u(t)\delta(t-2)$

2. The LTI system with $h(t) = \delta(t-1) + e^{t}u(-t-1)$ is

   $e^{-(t+1)}$

   a. causal and nonstable
   b. causal and stable $-(t+1)$
   c. noncausal but stable
   d. need more information
   e. noncausal and nonstable

3. The output of a system is given by $y(t) = (ax(t)+1)^2 - x(t)^2 - b$. For which values of a and b is the system linear.

   $a^2x^2(t) + 2ax(t) + 1 - x^2(t)$

   a. $a = \pm 1$, $b = 0$
   b. need more information

c. $a = -1, b = 1$

d. $a = 1, b = 1$

e. $a = \pm 1, b = 1$

4. The input $x(t) = u(t+2) - u(t-2)$ is applied to an LTI system with impulse response $h(t) = t$. The value of the output signal at $t = 3$ is $y(3) =$

a. zero

b. 12

c. 15/2

d. 25/2

e. none of these

5. Consider a continuous-time LTI system with impulse response $h(t) = u(t) - 2u(t-2) + u(t-4)$. If the input signal $x(t) = u(t)$, then the response $y(t)$ at $t = 4$ is

a. 1

b. -1

c. 2

d. none of these

e. zero

6. The integral $\int_{-\infty}^{\infty} (t+2)\delta(4-2t)dt$ has the value

a. 2

b. 4

c. 8

d. none of these

e. zero

7. Which of the following statements is FALSE for convolution?

a. $x(t) * [y(t)z(t)] = [x(t) * y(t)]z(t)$

b. all are correct

c. $x(t) * \delta(t - t_0) = x(t - t_0)$

d. $x(t) * y(t) = y(t) * x(t)$

e. $x(t) * [y(t) + z(t)] = [x(t) * y(t)] + [x(t) * z(t)]$

8. Consider the following statements

S1: The set of the two functions $\{1/2, (t - 1/2)\}$ is orthogonal over interval $(0, 1)$.
S2: The set of the two functions $\{1, (2t - 1)\}$ is orthonormal over interval $(0, 1)$.

a. S1 is true but S2 is false

b. S1 and S2 are false

c. none of these

d. S1 and S2 are true

e. S1 is false but S2 is true

9. An LTI system has input $x[n] = \delta[n-2]$ which gives the output $y[n] = u[n-3]$. The impulse response is

a. $h[n] = u[n-1]$
b. $h[n] = u[n-3] - u[n-2]$
c. $h[n] = u[n-3] - u[n-1]$
d. $h[n] = u[n-2]$
e. $h[n] = u[n]$

10. Calculate the output $y[n]$ when the sequence $x[n] = \{1, -1, 1\}$ is input to a linear time-invariant system that has an impulse response given by $h[n] = \{3, 2, 1\}$.

a. none of these
b. $y[n] = \{3, -2, 1\}$
c. $y[n] = \{3, 8, 14, 8, 3\}$
d. $y[n] = \{3, -1, 2, 1, 1\}$
e. $y[n] = \{-1, 8, 5, 8, 3\}$

11. Given the function $x(t) = \mathrm{Sa}\left(\dfrac{t-\pi}{3}\right)$. The second null will occur at $t =$

a. 6π
b. 4π
c. 7π
d. 3π
e. none of these

12. Calculate the energy in the signal $x(t) = 5t$, for $0 \le t < 1$ and $x(t) = 0$ otherwise.

a. 25
b. infinity
c. none of these
d. 25/4
e. 25/3

13. The continuous-time signal $x(t) = 4\sin(4\pi t) - 6\cos(6\pi t)$

a. is periodic with fudamental period $T_0 = 2$
b. is periodic with fundamental period $T_0 = 1$
c. is periodic with fundamental period $T_0 = 1/2$
d. is not periodic
e. none of these

14. Evaluate the following integral, $\displaystyle\int_{-\infty}^{\infty} u(\tau - 1)u(t-\tau)d\tau$.

a. $tu(t)$
b. $(t-1)u(t-1)$
c. $t-1$
d. $(t-1)u(t)$

e. $tu(t-1)$

15. If $x(t) = u(t+1)u(1-t) - 2r(t-3)$, then the generalized derivative of $x(t)$ is

a. none of these

b. $\delta(t+1)\delta(1-t) - 2$

c. $\delta(t+1)\delta(1-t) - 2u(t-3)$

d. $\delta(t+1) - \delta(t-1) - 2u(t-3)$

e. $\delta(t)u(1-t) + u(t+1)\delta(-t) - 2$

16. Given $f(t) = rect\left(\frac{2t-1}{2}\right)$ and $g(t) = rect\left(\frac{t-4}{2}\right)$. $g(t)$ can be expressed as

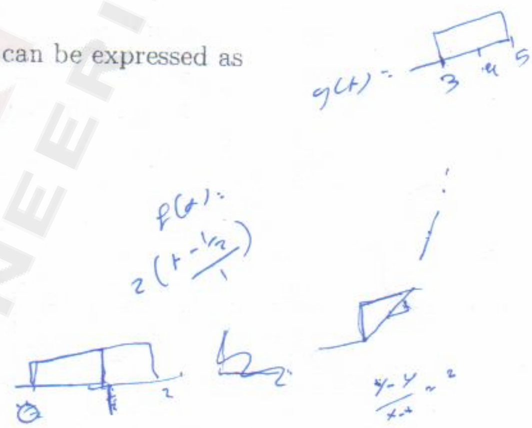
a. $g(t) = f(t/2 - 3/2)$

b. none of these

c. $g(t) = f(2t-3)$

d. $g(t) = f(2t - 3/2)$

e. $g(t) = f(t/2 - 3)$



$f(\frac{t}{2}+3$

$u(1-t)$

$u(-(t-1))$

$-2u(t-3)$