Signals and Systems
Quiz 2

(10 questions to be chosen randomly, 5 from easy, 5 from medium)

System Properties (Easy)

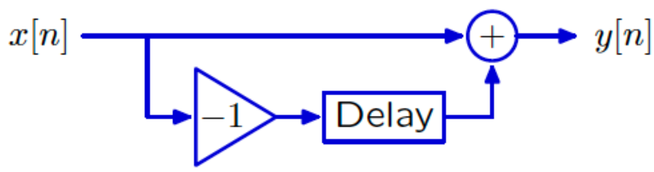
1. Consider a system where output $y(t) = x(t)\cos(\omega(t-3))$. The system is
   a. Linear and time invariant
   b. Nonlinear and time invariant
   c. Linear and time variant
   d. Nonlinear and time variant
2. Consider a system where output $y(t) = (t+1)^2x(t)$. The system is
   a. Linear and time invariant
   b. Nonlinear and time invariant
   c. Nonlinear and time variant
   d. Linear and time variant
3. Consider a system where output $y(t) = x(t+1)+x(-t-1)$. The system is
   a. Linear and time variant
   b. Linear and time invariant
   c. Nonlinear and time invariant
   d. Nonlinear and time variant
4. Impulse response of a system is given as $h[n] = (-3)^{-n}u[n-3]$, the system is
   a. Causal & Stable
   b. Non causal, not stable
   c. non causal, stable
   d. causal, not stable
5. Given system $y(t) = x^4(t+4)+x^3(t-4)$, the system is
   a. Stable, causal and invertible
   b. Stable, non-causal and non-invertible
   c. Non-stable, non-causal and non-invertible
   d. Stable, causal and non-invertible
6. Consider a system where output $y(t) = x(t)+\sin(t)$. The system is
   a. Linear and time invariant
   b. Nonlinear and time invariant
   c. Nonlinear and time variant
   d. Linear and time variant
7. Consider a system where output $y(t) = ax(t)+b$. For what values of a and b will be system be linear time invariant?
   a. a= 2, b=1
   b. a= 2 , b=0
   c. a=sin(t), b= 0
   d. a=sin(t), b=1
8. Given system $y(t) = x^k(t+m)$, for what values of k and m will the system be causal and invertible?
   a. k = 2, m=-1
   b. k=3, m =-1
   c. k=4, m=1
   d. k=3, m=1

9. Consider a system where output y(t) = x(t+1)*x(-t-1). The system is
    a. Causal & Stable
    b. Non causal, not stable
    c. non causal, stable
    d. causal, not stable
10. If y[n] = 1.5x[n] – x[n-1] + x[n+1], what is the impulse response of the system?
    a. h[n] = δ[n] – δ[n-1] + δ[n+1]
    b. h[n] = δ[n] + δ[n-1] + δ[n+1]
    c. h[n] = 1.5δ[n] – δ[n-1] + δ[n+1]
    d. h[n] = 1.5 δ[n] + δ[n-1] - δ[n+1]

11. If y[n] = x[n] – x[n-1] + x^2[n+2], the system is
    a. Causal & Stable
    b. Non causal, not stable
    c. non causal, stable
    d. causal, not stable

12. If Y = (1- 2R + R^2) X, the output y[n] depends upon
    a. x[n], y[n-1] and y[n-2]
    b. x[n], y[n-1] and x[n-2]
    c. x[n], x[n-1] and y[n-2]
    d. x[n], x[n-1] and x[n-2]

13. For a system with block diagram given below, the difference equation is



    a. y[n]= x[n] +1.2y[n-1]
    b. y[n]= x[n] – x[n-1]
    c. y[n] = x[n] + x[n-1]
    d. y[n] = -x[n] + x[n+1]

14. If y[n] = x[n] – 1.01y[n-1] , impulse response of the systems is
    a. finite length and convergent
    b. infinite length and convergent
    c. finite length and divergent
    d. infinite length and divergent

15. Impulse response of a system is given as h[n] = $(-1)^n$u[n+1], the system is
    a. Causal & Stable
    b. Non causal, not stable
    c. non causal, stable
    d. causal, not stable

Convolution (Medium/Hard)

16. Let y[n]=x[n]*h[n]. The impulse response h[n] = $(1/2)^n$u(n) and x[n] is a causal signal. If y[0] = 1 and y[1] = 1, the values of x[0] and x[1] would be
    a. x[0]=1, x[1] = 1
    b. x[0]=1, x[1] = 1/2
    c. x[0]=1/2, x[1] = 1
    d. x[0]=1, x[1] = 0
17. Let y[n]=x[n]*h[n]. The impulse response h[n] = 2u(n) and x[n] is a causal signal. If y[0] = 1 and y[1] = 1, the values of x[0] and x[1] would be
    a. x[0]=1, x[1] = 0
    b. x[0]=1/2, x[1] = 1/2
    c. x[0]=1/2, x[1] = 0
    d. x[0]=1, x[1] = 0
18. Let y[n]=x[n]*h[n]. The impulse response $h[n] = 2^n, -1 \leq n \leq 4$ and $x[n] = 1, 0 \leq n \leq 2$. The length of y[n] and its maximum value will be
    a. Length = 8, max = 28
    b. Length = 7, max = 13
    c. Length = 8, max = 13
    d. Length = 7, max = 28
19. Given two discrete time signal x[n] = 2^{-n}u[n] and h[n] =u[n], the convolved signal y[n]=x[n]*h[n] would be,
    a. 2^{-n}
    b. 2^{-n}u[n]+u[n]
    c. $(2-2^{-n})$u[n]
    d. $(1/2 – (1/2)^n)$u[n]
20. Given two continuous time signals x(t) = $e^{-\alpha t}$u(t) and h(t)=u(t), the convolved signal y(t)=x(t)*h(t) would be,
    a. α^{-t}u(t)
    b. $(1/\alpha)(1-e^{-\alpha t})$u(t)
    c. $(1/\alpha)(1+e^{-\alpha t})$u(t)
    d. $(1/\alpha)(1-e^{\alpha t})$u(t)
21. Two systems h1[n] and h2[n] are connected in cascade. If h1[n] = h2[n] =u[n], the response of the combined system is
    a. h[n]=u[n]
    b. h[n] = u^2[n]
    c. h[n]=nu[n]
    d. h[n]=(n+1)u[n]
22. Two systems h1[n] and h2[n] are connected in parallel, If h1[n]=2^{-n}u[n+2] and h2[n]= 2^nu[n-2], the combined system will be
    a. Stable and causal
    b. Non causal, not stable
    c. non causal, stable
    d. causal, not stable
23. Let y[n]=x[n]*h[n]. The impulse response $h[n] = (-1)^n, -2 \leq n \leq 4$ and $x[n] = 1, 0 \leq n \leq 3$. The length of y[n] and its maximum value will be
    a. Length = 10, max = 1

b. Length = 11, max = 2
c. Length = 10, max = 4
d. Length = 11, max = 3

24. Let y[n]=x[n]*h[n]. The impulse response $h[n] = (-2)^n, -2 \leq n \leq 4$and $x[n] = 1, 0 \leq n \leq 3$. The length of y[n] and its smallest value will be
    a. Length = 10, min = -2
    b. Length = 11, min = -4
    c. Length = 10, min = 0
    d. Length = 11, min = -6
25. The system is represented by the following equation Y= X+1.2*R*Y-0.32R^2Y. The poles of the system are at
    a. 0.8 and 0.4
    b. -0.8 and 0.4
    c. 0.8 and -0.4
    d. -0.8 and -0.4

26. For $x_1[n] = \delta[n]$, the output $y_1[n] = (-0.5)^n$. If the new input $x_2[n] = \delta[n] + \delta[n-1]$, $y_2[1]$ and $y_2[2]$ will be
    a. -1/2, -1/2
    b. 1/2, -1/4
    c. 1, -1/2
    d. -1/2, 1/4

27. For $x_1[n] = \delta[n]$, the output $y_1[n] = (-1)^n$. If the new inputs $x_2[n] = \delta[n] + \delta[n-2]$, $y_2[0]$, y[1] and $y_2[2]$ will be
    a. 0, -1, 1
    b. 1, 2, 2
    c. 2, -2, 2
    d. 1, 0 , 0

28. For x[n] = u[n], the output y[n] = δ[n]. The impulse response of the system is
    a. h[n] = δ[n]
    b. h[n] = δ[n-1]
    c. h[n] = δ[n]+ δ[n-1]
    d. h[n] = δ[n] - δ[n-1]

29. Two systems h1(t) and h2(t) are connected in cascade. If h1(t) = δ(t-4) and h2(t)=u(t) the response of the combined system is
    a. h(t)=u(t-4)
    b. h(t)=u(t+4)
    c. h(t)=u(t)+ δ(t-4)
    d. h(t)=u(t)