

1. For a unit step function the value of the function should be:
- a) 0 for  $t < 0$  and 1 for  $t \geq 0$
  - b) 0 for  $t < 0$  and -1 for  $t \geq 0$
  - c) 0 everywhere except for the 0 itself
  - d) None of the above

**Answer: (a)**

2. A system which is linear is said to obey the rules of:
- a) Scaling
  - b) Additivity
  - c) Both scaling and additivity
  - d) None of the above

**Answer: (c)**

3. A time invariant system is a system whose output:
- a) Increases with a delay in input
  - b) Remains same with a delay in input
  - c) Decreases with a delay in input
  - d) Vanishes with a delay in input

**Answer: (b)**

4. Signal is defined as:
- a) A quantitative description of a physical phenomenon, event or the process.
  - b) A function represents a physical quantity or variable containing the information about the behavior and nature of the phenomenon.
  - c) A device or a set of rules defining the functional relation between the input and output.
  - d) Both (a) and (b)

**Answer: (d)**

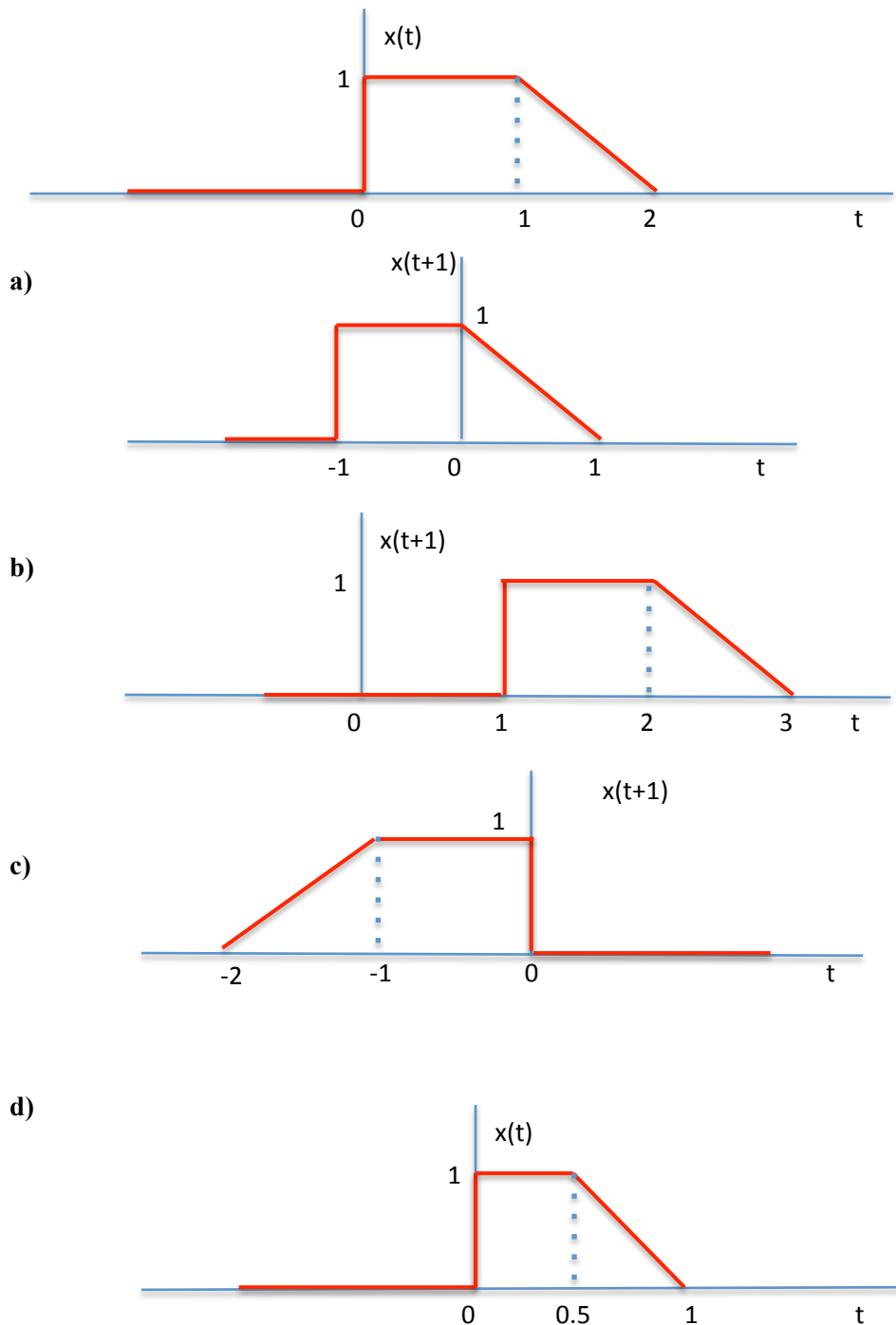
5. In a time shift operation, if  $t_0 > 0$  then:
- a) The time shift is known as advance.
  - b) The time shift is known as delay.
  - c) The signal is decimated.
  - d) None of the above.

**Answer: (b)**

6. If  $0 < a < 1$ , the time scale of the resultant signal is:
- a) Decimated.
  - b) Speedup.
  - c) Slowed down.
  - d) None of the above.

**Answer: (c)**

7. For the signal shown below, if we shift it with  $t_0 = -1$ , then the result will be:



**Answer: (a)**

8. A system is said to be defined as non-causal, when:

- a) The output at the present depends on the input at an earlier time.
- b) The output at the present does not depend on the factor of time at all.
- c) The output at the present depends on the input at a time instant in the future.
- d) The output at the present depends on the input at the current time.

**Answer: (c)**

9. Is the function  $y[n] = x[n-1] - x[n-4]$  memoryless?
- a) The system is memoryless.
  - b) The system needs to have memory, so it is with memory.
  - c) The system is neither memoryless nor with memory.
  - d) None of the above.

**Answer: (b)**

10. In real exponential function if  $\alpha > 0$  then the graph will:
- a) Decrease exponentially.
  - b) Grows exponentially.
  - c) Increase exponentially.
  - d) Both (b) and (c).

**Answer: (d)**

11. A signal  $x(t)$  is said to be power signal if:
- a)  $0 < P < \infty$  and  $E = \infty$
  - b)  $0 < P < E$  and  $E = 0$
  - c)  $0 < P < \infty$  and  $E = 0$
  - d) None of the above

**Answer: (a)**

12. The unit impulse function is also known as:
- a) Dirac Delta function.
  - b) Step function.
  - c) Both (a) and (b).
  - d) None of the above.

**Answer: (a)**

13. A signal cannot be both an energy signal and a power signal.
- a) False.
  - b) True.
  - c) May be.
  - d) None of the above.

**Answer: (b)**

14. The discrete-time unit impulse function  $\delta[n]$  is defined as:
- a)  $\delta[n] = \begin{cases} 0 & \text{for } n = 0 \\ 1 & \text{for } n \neq 0 \end{cases}$
  - b)  $\delta[n] = \begin{cases} 1 & \text{for } n = 0 \\ 0 & \text{for } n \neq 0 \end{cases}$
  - c)  $\delta[n] = \begin{cases} 1 & \text{for } n > 0 \\ 0 & \text{for } n < 0 \end{cases}$
  - d) None of the above.

**Answer: (b)**

15. The convolution of  $x(t)$  and  $h(t)$  is defined by:

- a)  $y(t) = \int_{-\infty}^{\infty} x(\tau)h(t - \tau)d\tau$
- b)  $y(t) = \int_{-\infty}^{\infty} [x(\tau) + h(t - \tau)]d\tau$
- c)  $y(t) = \int_{-\infty}^{\infty} x(\tau)h(t - \tau)d\tau$
- d) None of the above.

**Answer: (c)**

16. If the output is a scaled version of its input, then the input function is called as:

- a) Eigenvalue of the system.
- b) Eigenfunction of the system.
- c) Both (a) and (b).
- d) None of the above.

**Answer: (b)**

17. Memory in a discrete time system is analog if:

- a) Energy storage in a continuous time system.
- b) Memory in a continuous time system.
- c) Sampled memory of a continuous time LTI system.
- d) None of the above.

**Answer: (a)**

18. The system  $y(t) = x(t) + \frac{1}{3}x(t - 3)$  is:

- a) Non-causal system.
- b) Causal system.
- c) Partly A and partly B.
- d) None of the above.

**Answer: (b)**

19. Two sequences  $x_1(n)$  and  $x_2(n)$  are related by  $x_2(n) = x_1(-n)$ . In the z-domain, their ROC's are:

- a) The same.
- b) Reciprocal of each other.
- c) Negative of each other.
- d) None of the above.

**Answer: (b)**

20. \_\_\_\_\_ data have discrete states and take discrete values.

- a) Digital.
- b) Analog.
- c) (a) or (b) .
- d) None of the above.

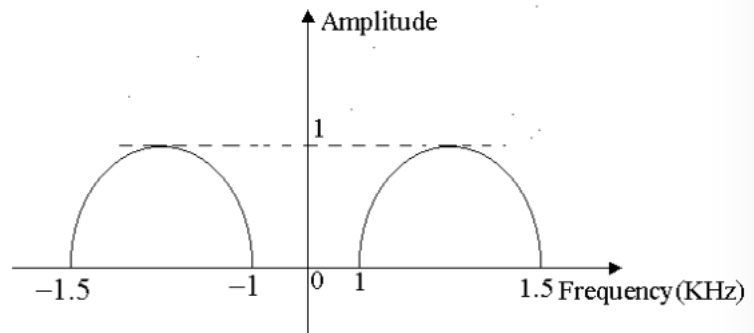
**Answer: (a)**

21. The Fourier transform (FT) of a function  $x[n]$  is  $X(e^{j\omega})$ . The FT of  $nx[n]$  will be:

- a)  $\frac{dx(t)}{dt}$
- b)  $jfX(e^{j\omega})$ .
- c)  $j\frac{dX(e^{j\omega})}{d\omega}$ .
- d) None of the above.

**Answer: (c)**

22. An analog signal has the spectrum shown below. The minimum sampling rate needed to completely represent this signal is:



- a) 1 KHz.
- b) 2 KHz.
- c) 3 KHz.
- d) None of the above.

**Answer: (a)**

23. The impulse response of a system is  $h[n] = a^n u[n]$ . The condition for the system to be BIBO stable is:

- a) "a" is real and positive.
- b) "a" is real and negative.
- c)  $|a| > 1$ .
- d)  $|a| < 1$ .

**Answer: (d)**

24. If  $R_1$  is the region of convergence of  $x(n)$  and  $R_2$  is the region of convergence of  $y(n)$ , then the region of convergence of  $x(n)$  convoluted  $y(n)$  is:

- a)  $R_1 + R_2$ .
- b)  $R_1 - R_2$ .
- c)  $R_1 \cap R_2$ .
- d)  $R_1 \cup R_2$ .

**Answer: (c)**

25. The continuous time system described by  $y(t) = x(t^2)$  is:

- a) Causal, linear and time varying.
- b) Causal, non-linear and time varying.
- c) Non-causal, non-linear and time-invariant.
- d) Non-causal, linear and time-invariant.

**Answer: (d)**

26.  $x[n] = a^{|n|}$ ,  $|a| < 1$  is:

- a) An energy signal.
- b) A power signal.
- c) Neither energy nor a power signal.
- d) None of the above.

**Answer: (a)**

27. A band pass signal extends from 1 KHz to 2 KHz. The minimum sampling frequency needed to retain all information in the sampled signal is:

- a) 1 KHz.
- b) 2 KHz.
- c) 3 KHz.
- d) None of the above.

**Answer: (b)**

28. The region of convergence of the z-transform of the signal  $2^n u[n] - 3^n u[-n - 1]$  is:

- a)  $|z| > 1$ .
- b)  $|z| < 1$ .
- c)  $2 < |z| < 3$ .
- d) Does not exist.

**Answer: (c)**

29. The number of possible regions of convergence of the function  $\frac{(e^{-2}-2)z}{(z-e^{-2})(z-2)}$  is:

- a) 1.
- b) 3.
- c) 2.
- d) None of the above.

**Answer: (b)**

30. Given a unit step function  $u(t)$ , its time-derivative is:

- a) A unit impulse.
- b) Another step function.
- c) A unit ramp function.
- d) None of the above.

**Answer: (a)**

31. The frequency response of a system with  $h[n] = \delta[n] - \delta[n - 1]$  is given by:

- a)  $\delta(\omega) - \delta(\omega - 1)$ .
- b)  $u(\omega) - u(\omega - 1)$ .
- c)  $1 - e^{-j\omega}$ .
- d)  $1 - e^{j\omega}$ .

**Answer: (b)**

32. z-transform converts convolution of time-signals to:

- a) Multiplication.
- b) Addition.
- c) Division.
- d) None of the above.

**Answer: (a)**

33. The Fourier transform of  $u[n]$  is:

- a)  $\frac{1}{1 - e^{-\omega}}$ .
- b)  $\frac{1}{1 - e^{-j\omega}}$ .
- c)  $\frac{1}{j2\pi f}$ .
- d) None of the above.

**Answer: (d)**

34. The system having input  $x[n]$  related to output  $y[n]$  as  $y[n] = \log_{10}|x[n]|$  is:

- a) Nonlinear, causal, not stable.
- b) Nonlinear, non-causal, not stable.
- c) Nonlinear, causal, stable.
- d) None of the above.

**Answer: (c)**

35. To obtain  $x(4 - 2n)$  from the given signal  $x[n]$ , the following procedure (or priority) rule is used for operations on the independent variable  $n$ :

- a) Time scaling  $\rightarrow$  Time shifting  $\rightarrow$  Reflection
- b) Time shifting  $\rightarrow$  Time scaling  $\rightarrow$  Reflection
- c) Reflection  $\rightarrow$  Time shifting  $\rightarrow$  Time scaling.
- d) None of the above.

**Answer: (b)**

36. The unit step-response of a system with impulse response  $h[n] = \delta[n] - \delta[n - 1]$  is:

- a)  $\delta[n]$ .
- b)  $\delta[n - 1]$ .
- c)  $u[n]$ .
- d) None of the above.

**Answer: (a)**

37. The ROC of the z-transform of the signal  $x[n] = \{2,1,1,2\}; n(0) = 1$  is:

- a) All  $z$ , except  $z = 0$ .
- b) All  $z$ , except  $z = \infty$ .
- c) All  $z$ , except  $z = 0$  and  $z = \infty$ .
- d) None of the above.

**Answer: (c)**

38. A continuous-time periodic signal  $x(t)$ , having a period  $T$ , is convolved with itself. The resulting signal is:

- a) Not periodic.
- b) Periodic having a period  $T$ .
- c) Periodic having a period  $2T$ .
- d) None of the above.

**Answer: (b)**

39. If the Fourier series coefficients of a signal are periodic then the signal must be:

- a) Continuous-time, periodic.
- b) Continuous-time, non periodic.
- c) Discrete-time, non periodic.
- d) Discrete-time, periodic.

**Answer: (d)**

40. Let  $H(e^{j\omega})$  be the frequency response of a discrete-time LTI system, and  $H_1(e^{j\omega})$  be the frequency response of its inverse. Then:

- a)  $H(e^{j\omega})H_1(e^{j\omega}) = 1$ .
- b)  $H(e^{j\omega})H_1(e^{j\omega}) = \delta(\omega)$ .
- c)  $H(e^{j\omega}) * H_1(e^{j\omega}) = \delta(\omega)$ .
- d) None of the above.

**Answer: (a)**

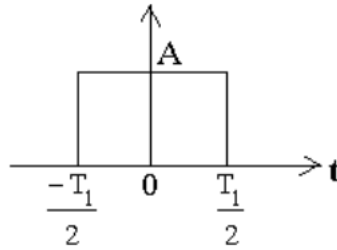
41. The transfer function of a stable system is  $H(z) = \frac{1}{1-0.5z^{-1}} + \frac{1}{1-2z^{-1}}$ . Its impulse response will be:

- a)  $(0.5)^n u[n] - (2)^n u[n]$ .
- b)  $-(0.5)^n u[n-1] + (2)^n u[n]$ .
- c)  $(0.5)^n u[n] - (2)^n u[-n-1]$ .
- d) None of the above.

**Answer: (c)**



42. The average power of the following signal is:



- a)  $\frac{A^2}{2}$ .
- b)  $A^2$ .
- c)  $A^2 T_1$ .
- d) None of the above.

**Answer: (c)**

43. Convolution is used to find:

- a) The impulse response of an LTI system.
- b) Frequency response of a system.
- c) The phase response of a LTI system.
- d) The time response of a LTI system.

**Answer: (d)**

44. The Fourier transform of a rectangular pulse is:

- a) Sinc function.
- b) Another rectangular pulse.
- c) Triangular pulse.
- d) None of the above.

**Answer: (a)**

45. The property of Fourier transform which states that the compression in time domain is equivalent to expansion in the frequency domain is:

- a) Duality.
- b) Frequency shifting.
- c) Scaling.
- d) None of the above.

**Answer: (c)**

46. What is the Nyquist frequency for the signal  $x(t) = 3 \cos 50\pi t + 10 \sin 300\pi t - \cos 100\pi t$ ?

- a) 100 Hz.
- b) 300 Hz.
- c) 60 Hz.
- d) None of the above.

**Answer: (b)**

47. The function which has its Fourier transform, Laplace transform and Z-transform unity is:
- a) Gaussian.
  - b) Sinc.
  - c) Pulse.
  - d) Impulse.

**Answer: (d)**

48. The z-transform of  $\delta[n - m]$  is:

- a)  $z^{-m}$ .
- b)  $z^m$ .
- c)  $\frac{1}{z}$ .
- d) None of the above.

**Answer: (a)**

49. The area under the curve  $\int_{-\infty}^{\infty} \delta(t) dt$  is:

- a)  $\infty$ .
- b) Unity.
- c) 0.
- d) None of the above.

**Answer: (b)**

50. For a stable system:

- a)  $|z| > 1$ .
- b)  $|z| = 1$ .
- c)  $|z| < 1$ .
- d) None of the above.

**Answer: (c)**