Choose the best answer:

1. One Dimensional signal is a function of:
   a) Multiple independent variables.
   b) Single independent variable.
   c) Single dependent variable.
   d) None of the above.

   Answer: (b)

2. The interface between an analog signal and a digital processor is:
   a) D/A converter.
   b) Modulator.
   c) Demodulator.
   d) None of the above.

   Answer: (d)

3. What are the important block(s) required to process an input analog signal to get an output analog signal?
   a) A/D converter.
   b) Digital signal processor.
   c) D/A converter.
   d) All of the above.

   Answer: (d)

4. The general form of exponential sequence is:
   a) $x(n) = A\alpha^n$
   b) $x(n) = AX(\omega)$
   c) $x(n) = A\cos(\omega n + \emptyset)$
   d) None of the above.

   Answer: (a)

5. A periodic sequence is a sequence for which:
   a) $x(n) = x[n - N]$
   b) $x(n) = x[n + N]$
   c) $x(n) = A\cos(\omega n + \emptyset)$
   d) None of the above.

   Answer: (b)

6. A system is said to be invertible if:
   a) The input signal can be recovered by output signal.
   b) If it depends only on the past and future values.
   c) If it is discrete.
   d) None of the above.

Answer: (a)

7. The DTFT $X(e^{j\omega})$ of a discrete time signal x(n) is defined as:
   a) $x(n) = \sum_{n=-\infty}^{\infty} x(n)e^{-j\omega n}$
   b) $X(e^{j\omega}) = \sum_{n=-\infty}^{\infty} x(n)e^{-j\omega n}$
   c) $X(z) = \sum_{n=-\infty}^{\infty} x(n)e^{-j\omega n}$
   d) None of the above.

Answer: (b)

8. The Z-Transform $X(z)$ of a discrete time signal x (n) is defined as:
   a) $\sum_{n=-\infty}^{\infty} x(n)e^{-j\omega n}$
   b) $\sum_{n=-\infty}^{\infty} x(n)z^{n}$
   c) $\sum_{n=-\infty}^{\infty} x(n)z^{-n}$
   d) None of the above.

Answer: (c)

9. The Fourier transform exists for a discrete time sequence x (n) if and only if the sequence is:
   a) Absolutely summable
   b) Absolutely integrable.
   c) Not summable
   d) None of the above

Answer: (a)

10. The Fourier Transform of the signal $x(n) = a^{n}u(n)$ is:
   a) $\frac{1}{1-ae^{-j\omega}}$
   b) $\frac{1}{1-a}$
   c) $\frac{n}{1-ae^{-j\omega}}$
   d) None of the above

Answer: (a)

11. DTFT is a periodic function of ω with period:
    a) π
    b) $\frac{3\pi}{2}$
    c) 2π
    d) None of the above

Answer: (c)

12. What is the z-transform of the signal $x(n) = (0.5)^n u(n)$?
    a) $\frac{1}{1-0.5z^{-1}}$; $ROC|z| > 0.5$
    b) $\frac{1}{1-0.5z^{-1}}$; $ROC|z| < 0.5$
    c) $\frac{1}{1+0.5z^{-1}}$; $ROC|z| > 0.5$
    d) None of the above

Answer: (a)

13. The z-transform of a sequence x(n) which is given as $X(z) = \sum_{n=-\infty}^{\infty} x(n)z^{-n}$, is known as:
    a) Uni-Lateral Z-transform
    b) Bi-Lateral Z-transform
    c) Tri-Lateral Z-transform
    d) None of the above

Answer: (b)

14. Which of the following should be done in order to convert a continuous time signal to a discrete time signal?
    a) Differentiating
    b) Integrating
    c) Sampling
    d) None of the above

Answer: (c)

15. The process of reconstructing an analog signal from its samples is known as:
    a) A/D conversion
    b) D/A conversion
    c) Integration
    d) None of the above

Answer: (b)

16. The process of converting a signal from one rate to another is called as:
   a) Sample rate integration
   b) Sampling
   c) Sample rate conversion
   d) None of the above

Answer: (c)

17. Up-sampling consists of two steps:
   a) Expanding and Integration
   b) Expanding and Interpolating
   c) Reduction and Interpolating
   d) None of the above

Answer: (b)

18. The magnitude response of the following filter decreases monotonically as frequency increases:
   a) Butterworth Filter
   b) Chebyshev type-I
   c) Chebyshev type-II
   d) None of the above

Answer: (a)

19. The poles of Butterworth filter lies on:
   a) Sphere
   b) Circle
   c) Ellipse
   d) None of the above

Answer: (b)

20. IIR digital filters are of the following nature:
   a) Reversive
   b) Non-Recursive
   c) Recursive
   d) None of the above

Answer: (c)

21. What is the disadvantage of impulse invariant method:
   a) Anti aliasing
   b) One to one mapping
   c) Warping
   d) None of the above

Answer: (d)

22. Which of the IIR filter design method is antialiasing method?
   a) The method of mapping of differentials
   b) Impulse Invariant method
   c) Bilinear Trasnformation
   d) None of the above

Answer: (c)

23. Time shifting of discrete time signal means:
   a) $y[n] = x[n - k]$
   b) $y[n] = x[-n - k]$
   c) $y[n] = x[n]$
   d) None of the above

Answer: (a)

24. The basic properties of DFT includes:
   a) Linearity
   b) Circular Symmetry
   c) Summation
   d) Both (a) and (b)

Answer: (d)

25. Circular shift of an N point is equivalent to:
   a) Circular shift of its periodic extension and its vice versa.
   b) Circular shift of its aperiodic extension and its vice versa.
   c) Linear shift of its periodic extension and its vice versa.
   d) None of the above

Answer: (c)

26. The circular convolution of two sequences in time domain is equivalent to:
   a) Summation of DFTs of two sequences.
   b) Difference of DFTs of two sequences.
   c) Multiplication of DFTs of two sequences.
   d) None of the above

Answer: (c)

27. The ROC for casual system is:
   a) Inside the outermost pole
   b) Outside the outermost pole
   c) Both (a) and (b)
   d) None of the above

Answer: (b)

28. Stable system requires absolute summable impulse response, i.e., :
   a) $\sum_{k=-\infty}^{\infty} |h[n]| < 0$
   b) $\sum_{k=-\infty}^{\infty} |h[n]| = 0$
   c) $\sum_{k=-\infty}^{\infty} |h[n]| < \infty$.
   d) None of the above

Answer: (c)

29. A LTI system is stable and causal with a stable and causal inverse if and only is both the poles and zeros of H (z) are:
   a) Outside the unit circle.
   b) Inside the unit circle.
   c) Both (a) and (b).
   d) None of the above

Answer: (b)

30. A LTI system is stable and causal with a stable and causal inverse if and only is both the poles and zeros of H (z) are inside the unit circle. Such a system is known as:
   a) Minimum phase systems
   b) Maximum phase systems
   c) Both (a) and (b).
   d) None of the above

Answer: (a)

31. Zeros are the roots of N(s) in a polynomial by setting:
   a) N(s)=1
   b) N(s)=∞
   c) N(s)=0
   d) None of the above

Answer: (c)

32. The Nth order difference equation that corresponds to the linear combination of delayed output sequences equals to the linear combination of delayed input sequences is:
   a) $y(n) = \sum_{k=-\infty}^{\infty} |h[n]|$

b) $y(n) - \sum_{k=1}^{N} a_k y(n-k) = 0$

c) $y(n) - \sum_{k=1}^{N} a_k y(n-k) = \sum_{k=0}^{M} b_k x(n-k).$

d) None of the above

Answer: (c)

33. Which is a typical application of digital signal processing?
   a) Noise elimination.
   b) Musical signal processing
   c) Image processing
   d) All of the above

Answer: (d)

34. What do we call the manipulation of an analog signal in a digital domain?
   a) Analog-to-digital conversion
   b) Digit-to-analog conversion
   c) Digital signal processing
   d) None of the above

Answer: (b)

35. How are unwanted frequencies removed prior to digital conversion?
   a) Pre-filters
   b) Sample-and-hold circuits
   c) Digital signal processing
   d) All of the above

Answer: (a)

36. Which of the following best defines Nyquist frequency?
   a) The frequency of resonance for the filtering circuit.
   b) The second harmonic
   c) The highest frequency component of a given analog signal
   d) None of the above

Answer: (c)

37. The overlap save method is used to calculate:
   a) The discrete convolution between a sampled signal and a finite impulse response (FIR) filter
   b) The discrete convolution between a sampled signal and an infinite impulse response (IIR) filter
   c) The discrete convolution between a very long signal and a finite impulse response (FIR) filter

d) The discrete convolution between a very long signal and an infinite impulse response (IIR) filter

Answer: (c)

38. The basic elements required for the implementation of a linear time-invariant discrete-time system are:
   a) Adders
   b) Multipliers
   c) Memory for storing delayed sequence values
   d) All of the above

Answer: (d)

39. An implementation with the minimum number of delay elements is known as:
   a) Direct form-I
   b) Non-canonic form implementation
   c) Transposed form
   d) None of the above

Answer: (d)

40. A signal flow graph is a network:
   a) Directed branches that connect at nodes.
   b) Non-directed branches that connect at nodes.
   c) Both (a) and (b)
   d) None of the above

Answer: (a)

41. The node at the input side x(n) is known as:
   a) Source branch
   b) Sink node
   c) Source node
   d) None of the above

Answer: (c)

42. Source nodes are nodes that have no entering branches.
   a) True
   b) False
   c) Maybe
   d) None of the above

Answer: (a)

43. Sink nodes are nodes that have only:
   a) No entering branches
   b) Leaving branches
   c) Entering branches
   d) None of the above

Answer: (c)

44. Telegraph signals are examples of:
   a) Digital signals
   b) Analog signals.
   c) Impulse signals
   d) Pulse train

Answer: (a)

45. The DFT is preferred for:
   a) Its ability to determine the frequency component of the signal.
   b) Removal of noise.
   c) Both (a) and (b).
   d) None of the above

Answer: (a)

46. Frequency selectivity characteristics of DFT refers to:
   a) Ability to translate into frequency domain.
   b) Ability to convert into discrete signal.
   c) Both (a) and (b).
   d) None of the above

Answer: (d)

47. A signal is defined as:
   a) Any physical quantity that varies with time, space or another independent variable.
   b) Any physical quantity that varies with time, space or another dependent variable.
   c) Both (a) and (b).
   d) None of the above.

Answer: (a)

48. The cost of the digital processors is cheaper because:
  a) Processor allows time-sharing among a number of signals.
  b) The hardware is cheaper.
  c) Less power consumption
  d) None of the above.
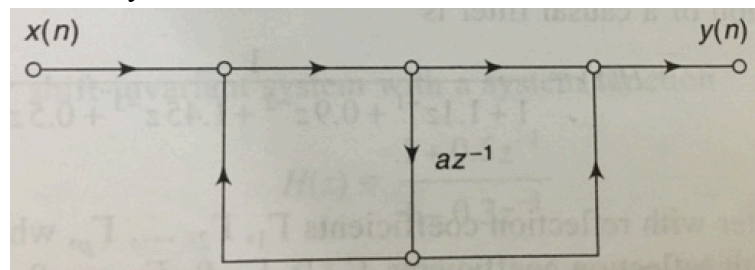
Answer: (a)

49. The speech signal is obtained after:
  a) Analog to digital conversion.
  b) Modulation
  c) Digital to analog conversion.
  d) None of the above.

Answer: (c)

50. What is the minimum number of multiplications and additions and delays required to implement a linear phase filter with h (n)=0 for n<0 and n>63?
  a) 63 delays, 63 additions and 63 multiplications
  b) 63 delays, 63 additions and 0 multiplications
  c) 63 delays, 63 additions and 32 multiplications
  d) None of the above

Answer: (c)

51. The system function for the following network, where az^{-1} is a unit delay combined with a multiplication by a:

  a) $\dfrac{1+az^{-1}}{1-az}$
  b) $\dfrac{1+az^{-1}}{1-az^{-1}}$
  c) $1 + az^{-1}$
  d) None of the above

Answer: (b)

52. What type of window (s) may be used to design a low-pass filter with a pass-band cutoff frequency $\omega_p = 0.35\pi$, a transition width $\Delta\omega = 0.025\pi$, and a maximum stop-band deviation of $\delta_s = 0.03$?
    a) A Hamming window
    b) A Blackman window
    c) A rectangle window
    d) Both (a) and (b)

Answer: (d)

53. Can an analog all-pass filter be mapped to a digital all-pass filter using the bilinear transformation?
    a) True
    b) False
    c) May be
    d) None of the above

Answer: (a)

54. If x (n) is an absolutely summable sequence with a rational z-transform that has poles at z=1/2 and z=2, what can be said about the extent of x(n) ?
    a) Two-sided
    b) Finite in length
    c) One-sided
    d) None of the above

Answer: (a)

55. Which of the following conditions made digital signal processing more advantageous over analog signal processing?
    a) Flexibility.
    b) Accuracy.
    c) Storage.
    d) All of the above.

Answer: (d)

56. Unit step sequence is defined as:
    a) $u(n) = \begin{cases} 0, & n = 0 \\ 1, & n \neq 0 \end{cases}$
    b) $u(n) = \begin{cases} 0, & n < 0 \\ 1, & n \geq 0 \end{cases}$
    c) Both (a) and (b).
    d) None of the above.

Answer: (b)

57. For the exponential sequence $x(n) = A\alpha^n$, if $|\alpha| > 1$ then:
   a) The sequence decrease in magnitude as n increases.
   b) The sequence grows in magnitude as n decreases.
   c) The sequence grows in magnitude as n increases.
   d) None of the above.

Answer: (c)

58. What is the z-transform of the finite duration signal $x(n) = \{2,4,5,7,0,1\}$?
   a) $2 + 4z + 5z^2 + 7z^3 + z^4$
   b) $2 + 4z + 5z^2 + 7z^3 + z^5$
   c) $2z^2 + 4z + 5 + 7z^{-1} + z^{-2}$
   d) $2z^2 + 4z + 5 + 7z^{-1} + z^{-3}$

Answer: (d)

59. If X (z) is the z-transform of x (n), the z-transform of the nx (n) is:
   a) $nx(n) \overset{Z}{\leftrightarrow} -z\frac{dX(z)}{dz}$
   b) $nx(n) \overset{Z}{\leftrightarrow} z\frac{dX(z)}{dz}$
   c) $nx(n) \overset{Z}{\leftrightarrow} -z\frac{dx(z)}{dz}$
   d) None of the above

Answer: (a)

60. The z-transform of $x(n) = n\alpha^n u(-n)$ is:
   a) $\frac{\alpha z}{1-\alpha z^{-1}}$
   b) $\frac{\alpha^{-1}z}{1-\alpha z^{-1}}$
   c) $\frac{\alpha^{-1}z}{(1-\alpha^{-1}z)^2}$
   d) None of the above

Answer: (d)

61. The initial-value theorem of z-transform is:
   a) $x[0] = \lim_{z\to\infty} x(z)$
   b) $x[0] = \lim_{z\to\infty} X(z)$
   c) $x[\infty] = \lim_{z\to\infty} X(z)$
   d) None of the above

Answer: (b)

62. If complex variable z is replaced with the complex variable $e^{j\omega}$, then the z-transform reduces to:
    a) Discrete time Fourier Transform
    b) Laplace Transform
    c) Both (a) and (b)
    d) None of the above

Answer: (a)

63. The Discrete Fourier transform DFT is:
    a) Same as the DTFT.
    b) The sampled version of DTFT output.
    c) Both (a) and (b)
    d) None of the above

Answer: (b)

64. The analysis equation of DFT is:
    a) $X(k) = \int_{n=0}^{N-1} x(n)e^{-jn\omega}$
    b) $X(k) = \sum_{n=0}^{N} x(n)e^{-j2\pi nk/N}$
    c) $X(k) = \sum_{n=0}^{N-1} x(n)e^{-j2\pi nk/N}$
    d) None of the above

Answer: (c)

65. The synthesis equation of DFT is:
    a) $X(k) = \frac{1}{N}\sum_{k} X(k)e^{j(2\pi/N)kn}$
    b) $x(n) = \frac{1}{N}\sum_{k} X(k)e^{j(2\pi/N)kn}$
    c) $x(n) = \sum_{k} X(k)e^{j(2\pi/N)kn}$
    d) None of the above

Answer: (b)

66. The s plane and z plane are related as:
    a) $z = e^{-st}$
    b) $z = e^{2sT}$
    c) $z = e^{sT}$
    d) None of the above

Answer: (c)

67. The similarity between the Fourier transform and the z-transform is that:

a) Both convert frequency spectrum domain to discrete time domain.
b) Both convert discrete time domain to frequency spectrum domain.
c) Both convert analog signal to digital signal.
d) Both convert digital signal to analog signal.

Answer: (b)

68. The ROC of a system is the:
  a) Range of z for which the z-transform converges.
  b) Range of frequency for which the z-transform exists.
  c) Range of frequency for which the signal gets transmitted.
  d) Range in which the signal s free of noise.

Answer: (a)

69. The anti causal sequences have --------- components in the left hand sequences:
  a) Positive
  b) Negative
  c) Both (a) and (b)
  d) None of the above

Answer: (a)

70. For an expanded power series method the coefficients represent:
  a) Inverse sequence values
  b) Original sequence values
  c) Negative values only
  d) Positive values only

Answer: (a)

71. The ROC of $\frac{x}{1+2x+x^2}$ is:
  a) Negative
  b) 0
  c) 2
  d) None of the above

Answer: (d)

72. For a system function H (s) to be stable:
  a) The zeros lie in the left half of the s plane

    b) The zeros lie in right half of the s plane

    c) The poles lie in the left half of the s plane

    d) None of the above

<div align="right">Answer: (c)</div>

73. In direct form for realization of IIR filter,

    1) Denominator coefficients are the multipliers in the feed forward paths.

    2) Multipliers in the feedback paths are the positives of the denominator coefficients.

    3) Numerator coefficients are the multipliers in the feed forward paths.

    4) Multipliers in the feedback paths are the negatives of the denominator coefficients.

    a) 1, 2 and 3 are correct

    b) 3 and 4 are correct

    c) 1 and 2 are correct

    d) All the four are correct

<div align="right">Answer: (b)</div>

74. The cascade realization of IIR systems involves

    1) The transfer function broken into product of transfer functions.

    2) The transfer function divided into addition of transfer functions.

    3) Factoring the numerator and denominator polynomials.

    4) Derivatives of the transfer functions.

    a) 1, 2 and 3 are correct

    b) 1 and 4 are correct

    c) 1 and 3 are correct

    d) All the four are correct

<div align="right">Answer: (c)</div>

75. The advantage of using the cascade form of realization is:

    1) It has same number of poles and zeros as that of individual components.

    2) The number of poles is the product of poles of individual components.

    3) The number of zeros is the product of poles of individual components.

    4) Over all transfer function may be determined.

    a) 1, 2 and 3 are correct

    b) 1 and 4 are correct

    c) 1 and 3 are correct

    d) All the four are correct

<div align="right">Answer: (b)</div>

76. Which among the following represent/s the characteristic/s of an ideal filter?
    a) Constant gain in pass-band
    b) Zero gain in stop-band
    c) Linear phase response
    d) All of the above

    Answer: (d)

77. FIR filters are:
    a) Recursive
    b) Non-recursive
    c) Use feedback
    d) All of the above

    Answer: (b)

78. IIR filters are:
    a) Recursive
    b) Non-recursive
    c) Do not adopt any feedback
    d) All of the above

    Answer: (a)

79. In tapped delay line filter, the tapped line is also known as:
    a) Pick-on node
    b) Pick-off node
    c) Pick-up node
    d) Pick-down node

    Answer: (b)

80. How is the sensitivity of filter coefficient quantization of FIR filter?
    a) Low
    b) Moderate
    c) High
    d) Unpredictable

    Answer: (a)

81. Decimation is a process in which the sampling rate is:
    a) Enhanced
    b) Stable
    c) Reduced
    d) Unpredictable

    Answer: (c)

82. In DSP processors, which among the following maintains the track of addresses of input data as well as the coefficients stored in data and program memories?
    a) Data Address Generators (DAGs)
    b) Program sequences
    c) Barrel shifter
    d) MAC

Answer: (a)

83. The scaling of a sequence x (n) by a factor a is given by:
    a) $y(n) = a[x(n)]^2$
    b) $y(n) = ax[n]^2$
    c) $y(n) = ax(n)$
    d) None of the above

Answer: (c)

84. DFT is applied to:
    a) Infinite sequences
    b) Finite discrete sequences
    c) Continuous infinite signals
    d) Continuous finite sequences

Answer: (b)

85. In Overlap-Add method with linear convolution of a discrete time signal of length L and a discrete time signal of length M, for a length N, zero padding should be of length:
    a) L, M>N
    b) L, M=N
    c) L, M<N
    d) None of the above

Answer: (c)

86. A system is said to be unstable if:
    a) None of the poles of its transfer function is shifted t the right half of s-plane.
    b) At least one zero of its transfer function is shifted to the right half of s-plane.
    c) At least one pole of its transfer function is shifted to the right half of s-plane.
    d) At least one pole of its transfer function is shifted to the left half of s-plane.

Answer: (c)

87. In FIR filter design, which among the following parameters is/are separately controlled by using Kaiser window?
- **a)** Order of filter (M)
- **b)** Transition width of main lobe
- **c)** Both (a) and (b)
- **d)** None of the above

Answer: (c)

88. In linear phase realization, equal valued coefficients are taken common for reducing the requisite number of:
- **a)** Adders
- **b)** Multipliers
- **c)** Dividers
- **d)** None of the above

Answer: (b)

89. In Fir filters, which among the following parameters remain unaffected by the quantization effect?
- **a)** Magnitude response
- **b)** Phase characteristics
- **c)** Both (a) and (b)
- **d)** None of the above

Answer: (b)

90. The basic properties of DFT includes
- **1)** Linearity
- **2)** Periodicity
- **3)** Circular symmetry
- **4)** Summation
- **a)** 1, 2 and 3 are correct
- **b)** 1 and 4 are correct
- **c)** 1 and 2 are correct
- **d)** All the four are correct

Answer: (a)