UNIT I

PART A

1.What is the output of system to unit impulse signal called as……….

a) Fast response

b) Step response

c) Impulse response

d) Slow response ANS:C

2. h(n) is the ………….of the system

a) Transfer function

b) Impulse response

c) Trigger

d) Output function ANS:B

3. y(n) is obtained by ………….of input x(n) of the system with h(n)

a) Intergration

b) correlation

c) Differentiation

d) Convolution ANS:D

4. An example of impulse signal is ………….

a) Winking

b) Bat hitting ball

c) Accident

d) All the above ANS:D

5. The order of signal manipulation of any signal is ………….

a) Time reversal, time scaling, time shifting.

b) Time shifting, time scaling, time reversal

c) Time reversal, time shift, time scaling

d) Time scaling, time shift, time reversal ANS:C

6. X(n) = A n=0 0 n≠0 is a ………….sequence

a) Step

b) Impulse

c) Pulse

d) Ramp ANS:B

7. X(n) = A n≥0 0 n<0 is a …………sequence

a) Step

b) Impulse

c) Pulse

d) Ramp ANS:A

8. X(n) = n n≥0 0 n<0 is a …………sequence

a) Step

b) Impulse

c) Pulse

d) Ramp ANS:D

9. The magnitude and angle of the complex number Z = a is

a) a, <90

b) a, <0

c) √a, <0

d) √a, <90 ANS:B

10. The magnitude and angle of the complex number Z = -j is …………

a) 0,<-90

b) -1,<0

c) 0.5,<0

d) 1,<-90 ANS:D

11.The magnitude and angle of the complex number Z = j is …………

a) 0, <90

b) 1, <0

c) 0.5, <0

d) 1, <90 ANS:D

12. The magnitude and angle of the complex number Z = 2+2j is …………

a) 2.82, <90

b) 2, <45

c) 2.82, <45

d) 2, <90 ANS:C

13. The magnitude and angle of the complex number (Z^3) if Z = 3 <45 is …………

a) 27, <90

b) 9, <45

c) 27, <135

d) 27, <180 ANS:C

14. If discrete time sequence x(n) is the input then its fourier transform is……….transform.

a) periodic

b) aperiodic

c) Sampled

d) Sampled and periodic ANS:A

15. If Periodic time domain signal is the input then its fourier transform is………….transform.

a) periodic

b) aperiodic

c) Sampled and periodic

d) Sampled ANS:D

16. Discrete Fourier Transform X(K) is equal to Discrete time fourier transform $x(ej\omega)$ When……..

a) $\omega = (2\pi kN/n)$

b) $\omega = (2\pi kn/N)$

c) $\omega = (4\pi kN/n)$

d) $\omega = (4\pi kn/N)$ ANS:B

17. Fourier Transform is obtained by……………… Discrete time fourier transform.

a) Compressing

b) Integrating

c) Differentiating

d) Sampling ANS:D

18. The number of additions in a N point Discrete Fourier Transform is ………………

a) N(N+1)

b) NxN

c) N(N-1)

d) 2N ANS:C

19. The number of multiplications in a N point Discrete Fourier Transform is ………………

a) N(N+1)

b) NxN

c) N(N-1)

d) 2N ANS:B

20.Twiddle Factor is ………………

a) $WN = e^{(-j.2\pi/N)}$

b) $WN = e^{(+j.2\pi/N)}$

c) $WN = e^{(-j.\pi/N)}$

d) $WN = e^{(+j.\pi/N)}$ ANS:A

21. Twiddle Factor W_4^1 is ………………

a) j

b) 1

c) -1

d) -j ANS:D

22. If X(K) is the DFT of x(n)={1,2,3,4) then X(0) is ………………

a) 8

b) 10

c) 11

d) 9 ANS:B

23. If X(K) is the DFT of x(n)={1,2,3,4) then X(2) is ………………

a) -1

b) 1

c) -2

d)-4 ANS: C

24. If X(K) ={ 10,……,-2, -2+2j}then X(1) is ………………

a) 2

b) -2-2j

c) -2+2j

d) -2 ANS:B

25. $WN^{k+N/2}$=?

a) WN^k

b) $–WN^k$

c) WN^{-k}

d) $WN^{-k/2}$ ANS: B

26. WN^{k+N} =?

a) WN^{k}

b) $-WN^{k}$

c) WN^{-k}

d) $WN^{k/2}$ ANS: A

27. If x(n) and X(k) are an N-point DFT pair, then X(k+N)=?
a) X(-k)
b) -X(k)
c) X(k)
d) None of the mentioned ANS:C

28. The number of multiplications in a N point Fast Fourier Transform is ………………

a) N $\log_2 N$

b) N(N-1)

c) (N/2) $\log_2 N$

d) NxN ANS:C

29. The number of additions in a N point Fast Fourier Transform is ………………

a) N $\log_2 N$

b) N(N-1)

c) (N/2) $\log_2 N$

d) NxN ANS:A

30. The number of multiplications in a 64 point Fast Fourier Transform is ………………

a) 190

b) 192

c) 194

d) 196 ANS:B

31. How many computational stages will be there in 16 point FFT………………

a) 3

b) 4

c) 2

d) 6 ANS:B

32. If $X_1(k)$ and $X_2(k)$ are the N-point DFTs of $X_1(n)$ and $x_2(n)$ respectively, then what is the N-point DFT of $x(n)=ax_1(n)+bx_2(n)$?
a) $X_1(ak)+X_2(bk)$
b) $aX_1(k)+bX_2(k)$

c) $e^{ak}X_1(k)+e^{bk}X_2(k)$
d) None of the mentioned ANS: B

33. In over lap add and save methods the length of each block N=………………

a) L-M-1

b) L-M+1

c) L+M+1

d) L+M-1 ANS:D

34. Twiddle Factor W_4^2 is ………………

a) j

b) 1

c) -1

d) -j ANS:C

35. Twiddle Factor W_4^3 is ………………

a) j

b) 1

c) -1

d) -j ANS:A

36. Twiddle Factor W_8^1 is ………………

a) j

b) 0.707-j0.707

c) -1

d) -0.707-j0.707ANS:B

37. Twiddle Factor W_8^3 is ………………

a) j

b) 0.707-j0.707

c) -1

d) -0.707-j0.707ANS:D

38. Twiddle Factor W_8^6 is ………………

a) j

b) 0.707-j0.707

c) -1

d) -0.707-j0.707ANS:A

39. Twiddle Factor W_8^5 is ………………

a) j

b)- 0.70+j0.707

c) -1

d) -0.707-j0.707ANS:B

40. If x(n) is a real sequence and X(k) is its N-point DFT, then which of the following is true?
a) X(N-k)=X(-k)
b) X(N-k)=X*(k)
c) X(-k)=X*(k)
d) All of the mentioned ANS:D

PART B

1.The 4-point Discrete Fourier Transform (DFT) of a discrete time sequence 1,0,2,3 is

(A) [0, −2 + 2j, 2, −2 − 2j]

(B) [2, 2 + 2j, 6, −2 − 2j]

(C) [6, 1 − 3j, 2, 1 + 3j]

(D) [6, −1 + 3j, 0, −1 − 3j] ANS: D

2. The Discrete time fourier transform of $x(n)= a^n u(n)$ is……………….

a) X(ejω) = $1/(1-a.\ e^{-j\omega})$

b) X(ejω) = $1/(1+a.\ e^{-j\omega})$

c) X(ejω) = $1/(1-a.\ e+^{j\omega})$

d) X(ejω) = $1/(1+a.\ e^{+j\omega})$ ANS:A

3. If Periodic and sampled time domain signal is the input then its fourier transform is………………transform.

a) periodic

b) aperiodic

c) Sampled and periodic

d) Sampled ANS:C

4. The relationship between Z transform and Discrete time fourier transform is……………….

a) $Z = e^{(-j\omega)}$

b) $Z = e^{(j\omega)}$

c) $Z = e^{(1/-j\omega)}$

d) $Z = e^{(1/j\omega)}$ ANS:B

5. Discrete Fourier Transform is………………transform.

a) periodic

b) aperiodic

c) Sampled and periodic

d) Sampled ANS:C

6. What is the circular convolution of the sequences of x1(n)={1,1,1,1},x2(n)={1,1,1,1}?

a) {6,4,4,6}

b) {4,4,4,4}

c) {5,5,5,5}

d) {4,6,6,4} ANS: B

7. What is the circular convolution of the sequences of x1(n)={1,2,3,4},x2(n)={1,1,1}?

a) {6,4,4,6}

b) {8,7,6,9}

c) {5,5,5,5}

d) {4,6,6,4} ANS: B

8. What is the convolution of the sequences of x1(n)=x2(n)={1,1,1}?

a) {1,2,3,2,1}

b) {1,2,3,2,1}

c) {1,1,1,1,1}

d) {1,1,1,1,1} ANS: A

9. What is the circular convolution of the sequences X_1(n)={2,1,2,1} and x_2(n)={1,2,3,4}?
a) {14,14,16,16}
b) {16,16,14,14}
c) {2,3,6,4}
d) {14,16,14,16} ANS:D

10. If X(k) is the N-point DFT of a sequence x(n), then what is the DFT of x*(n)?
a) X(N-k)
b) X*(k)
c) X*(N-k)
d) None of the mentioned ANS:C

11. What is the sequence y(n) that results from the use of four point DFTs if the impulse response is h(n)={1,2,3} and the input sequence x(n)={1,2,2,1}?
a) {9,9,7,11}
b) {1,4,9,11,8,3}
c) {7,9,7,11}
d) {9,7,9,11} ANS:D

12. In Overlap save method of long sequence filtering, how many zeros are appended to the impulse response of the FIR filter?

a) L+M
b) L
c) L+1
d) L-1 ANS: D

13. Which of the following is true in case of Overlap add method?
a) M zeros are appended at last of each data block
b) M zeros are appended at first of each data block
c) M-1 zeros are appended at last of each data block
d) M-1 zeros are appended at first of each data block ANS: C

14. The Discrete time fourier transform of $x(n)=- a^n u(-n-1)$ is……………….

a) $X(ej\omega) = 1/(1-a. e^{-j\omega})$

b) $X(ej\omega) = 1/(1+a. e^{-j\omega})$

c) $X(ej\omega) = 1/(1-a. e+^{j\omega})$

d) $X(ej\omega) = 1/(1+a. e^{+j\omega})$ ANS:A

15. The DFT of the sequence x(n)={1,1,1,1,1,1,1,1} is ………

a) {6,0,0,0,0,0,0,0}

b) {7,0,0,0,0,0,0,0}

c) {8,0,0,0,0,0,0,0}

d) {9,0,0,0,0,0,0,0} ANS: C

UNIT II

PART A

1. What is the maximum amplitude of the gain transfer function $|H(j\Omega)|$ in filters……….

a) 0.707

b) 1

c) 1.707

d) 0.866 ANS : B

2. The range of frequency through which the gain transfer function $|H(j\Omega)| = 1$ is……….

a) Stop Band

b) Pass Band

c) Transition Band

d) Narrow Band ANS : B

3. The range of frequency through which the gain transfer function $|H(j\Omega)| = 0$ is……….

a) Stop Band

b) Pass Band

c) Transition Band

d) Narrow Band ANS : A

4. At cut off frequency Ω_c amplitude of the gain transfer function $|H(j\Omega)|$ in practical filters is equal to……….

a) 0.707

b) 1

c) 1.707

d) 0.866 ANS : A

5. The frequency response given by

$|H(j\Omega)| = 1 \quad 0 \le \Omega \le \Omega_c$

$\qquad\qquad 0$ otherwise is a ……

a) High Pass Filter

b) Low Pass Filter

c) Band Pass Filter

d) Band Stop Filter ANS :B

6. The frequency response given by

$|H(j\Omega)| = 1 \quad \Omega_c \leq \Omega \leq \pi$

0 otherwise is a ……

a) High Pass Filter

b) Low Pass Filter

c) Band Pass Filter

d) Band Stop Filter ANS :A

7. The frequency response given by

$|H(j\Omega)| = 1 \quad \Omega_{c1} \leq \Omega \leq \Omega_{c2}$

0 otherwise is a ……

a) High Pass Filter

b) Low Pass Filter

c) Band Pass Filter

d) Band Stop Filter ANS : C

8. The frequency response given by

$|H(j\Omega)| = 1 \quad 0 \leq \Omega \leq \Omega_{c1}$

$1 \quad \Omega_{c2} \leq \Omega \leq \pi$

0 otherwise is a ……

a) High Pass Filter

b) Low Pass Filter

c) Band Pass Filter

d) Band Stop Filter ANS : D

9. A filter generally consist of the passive component

a) R,L,C

b) R,C

c) LC

d) R,C OR L,C ANS : D

10.………….. Filter has a Flattest pass-band but a poor roll-off rate.

a) Butterworth

b) Elliptic

c) Chebhysev

d) Bessel ANS : A

11. ………….. Filter has pass-band ripple but a better (steeper) roll-off rate.

a) Chebhysev II

b) Elliptic

c) Chebhysev I

d) Bessel. ANS : C

12. ………….. Filter has Some pass- and stop-band ripple but with the steepest roll-off rate

a) Chebhysev II

b) Elliptic

c) Chebhysev I

d) Bessel. ANS : B

13. ………….. Filter has a Worst roll-off rate of all four filters but the best phase response.

a) Butterworth

b) Elliptic

c) Chebhysev

d) Bessel ANS : D

14. ………….. Filter has stop-band ripple but a better (steeper) roll-off rate.

a) Chebhysev II

b) Elliptic

c) Chebhysev I

d) Bessel ANS : A

15. The denominator polynomial of second order normalized LPF is…………..

a) $S^2 + 1.407S + 1$

b) $S^2 + 1.417S + 1$

c) $S^2 + 1.424S + 1$

d) $S^2 + 1.414S + 1$ ANS : D

16. In frequency response

$|H(j\Omega)| \leq 0.2 \qquad 0.6\pi \leq \Omega \leq \pi$

0.6π represents the --------- of the filter.

a) Ω_s

b) Ω_p

c) Ω_c

d) Ω_T ANS : A

17. ………. is the parameter related to stop band.

a) ξ

b) λ

c) α_p

d) A_s ANS : B

18. ………. is the parameter related to pass band.

a) ξ

b) λ

c) α_p

d) α_s ANS : A

19. The frequency response

$0.8 \leq |H(j\Omega)| \leq 1 \qquad 0 \leq \Omega \leq 0.2\pi$

represents the --------- of the filter.

a) Transition Band

b) Pass Band

c) Stop Band

d) None ANS : B

20. In frequency response

$0.8 \leq |H(j\Omega)| \leq 1 \qquad 0 \leq \Omega \leq 0.2\pi$

0.2π represents the --------- of the filter.

a) Ω_s

b) Ω_p

c) Ω_c

d) Ω_T ANS : B

21. The frequency response

$|H(j\Omega)| \le 0.2 \qquad 0.6\pi \le \Omega \le \pi$

represents the --------- of the filter.

a) Transition Band

b) Pass Band

c) Stop Band

d) None ANS : C

22. …………….realization structure requires minimum number of delay elements.

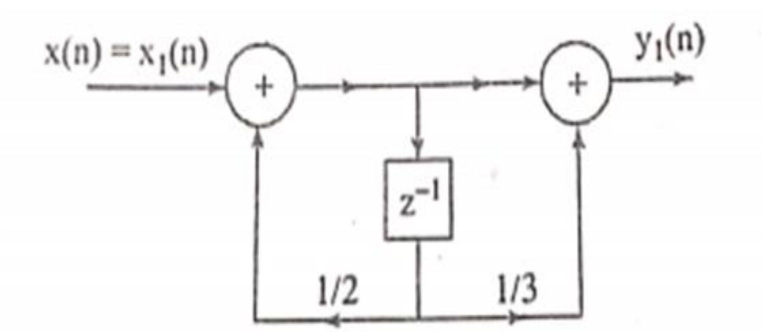
a) Direct Form I

b) Direct Form II

c) Lattice structure

d) Both a and b ANS : B

23. The difference equation of the realization structure is……….



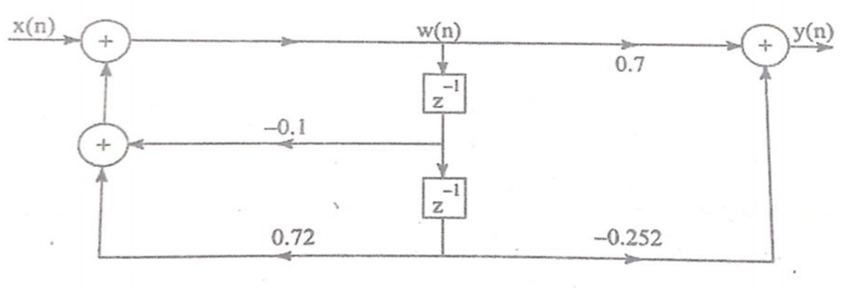
a) y(n)= -1/2 y(n-1) + x(n) + 1/3 x(n-1)

b) y(n)= 1/2 y(n-1) + x(n) + 1/3 x(n-1)

c) y(n)= -1/3 y(n-1) + x(n) + 1/2 x(n-1)

d) $y(n)= 1/3\ y(n-1) + x(n) + 1/2\ x(n-1)$ ANS : B

24. The difference equation of the realization structure is……….



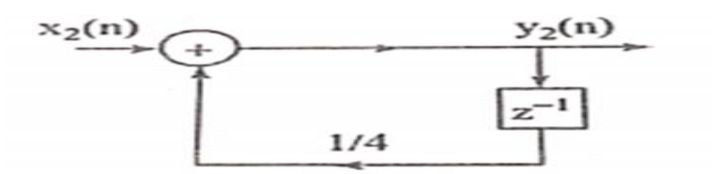
a) $y(n)= -0.1\ y(n-1) - 0.72\ y(n-1) + 0.7x(n) -0.252\ x(n-2)$

b) $y(n)= 0.1\ y(n-1) - 0.72\ y(n-1) + 0.7x(n) +0.252\ x(n-2)$

c) $y(n)= -0.1\ y(n-1) + 0.72\ y(n-1) + 0.7x(n) -0.252\ x(n-2)$

d) $y(n)= 0.1\ y(n-1) + 0.72\ y(n-1) + 0.7x(n) -0.252\ x(n-2)$ ANS : C

25. The digital transfer function of the realization structure is……….



a) $H_2(Z)= 1/(1-(1/4).\ Z^{-1})$

b) $H_2(Z)= 1/(1+(1/4).\ Z^{-1})$

c) $H_2(Z)= 1/(1-(4).\ Z^{-1})$

d) $H_2(Z)= 1/(1-(4).\ Z^{-1})$ ANS : A

26. $\Omega = (2/T)\tan(\omega/2)$ is the mapping formula from digital to analog domain in……………

a) The Impulse Invariant method

b) Matched z-transform method

c) The Bilinear transformation method

d) Approximation of derivatives ANS : C

27. $\Omega = \omega T$ is the mapping formula from digital to analog domain in……………

a) The Impulse Invariant method

b) Matched z-transform method

c) The Bilinear transformation method

d) Approximation of derivatives ANS : A

28. $0.707 \leq |X(e^{(jw)})| \leq 1 \qquad 0 \leq \omega \leq \pi/2$
$\leq |X(e^{(jw)})| \leq 0.2 \qquad (3/4)\pi \leq \omega \leq \pi$

The value of ξ for this frequency response is

a) 1

b) 1.2

c) 1.3

d) 1.4 ANS : A

29. $0.707 \leq |X(e^{(jw)})| \leq 1 \qquad 0 \leq \omega \leq \pi/2$
$\leq |X(e^{(jw)})| \leq 0.2 \qquad (3/4)\pi \leq \omega \leq \pi$

The value of Ω_C for this frequency response is

a) $(3/4)\pi$

b) $(1/2)\pi$

c) $(1/4)\pi$

d) $(5/4)\pi$ ANS : B

30. $0.707 \leq |X(e^{(jw)})| \leq 1 \qquad 0 \leq \omega \leq \pi/2$
$\leq |X(e^{(jw)})| \leq 0.2 \qquad (3/4)\pi \leq \omega \leq \pi$

The value of λ for this frequency response is

a) 4.953

b) 4.536

c) 4.898

d) 4.62 ANS :C

31. In analog butterworth filter with the response

$0.8 \leq |H(j\Omega)| \leq 1 \qquad 0 \leq \Omega \leq 0.2\pi$
$\leq |H(j\Omega)| \leq 0.2 \qquad 0.6\pi \leq \Omega \leq \pi$

The value of N is ……………………

a) 1

b) 3

c) 2

d) 4 ANS :C

32. The locus of all the poles of Butterworth filter form a……………

a) Circle

b) Parabola

c) Ellipse

d) Hyperbola ANS : A

33. The locus of all the poles of Chebyshev filter form a……………

a) Circle

b) Parabola

c) Ellipse

d) Hyperbola ANS :C

34. $N \geq [\log(\lambda / \xi)/\log(\Omega_{s/}\ \Omega_p)]$ is the formula for order of the filter in…………

a) Butterworth

b) Chebyshev

c) Elliptical

d) Bessel ANS : A

35. $N \geq [\cosh^{-1}(\lambda / \xi)/\cosh^{-1} \log(\Omega_{s/}\ \Omega_p)]$

is the formula for order of the filter in…………

a) Butterworth

b) Chebyshev

c) Elliptical

d) Bessel ANS :B

36. ……………………is the formula for finding the μ of the chebhysev filter.

a) $\xi^{-2} + [\xi^{-2} + 1]^{0.5}$

b) $\xi^{-1} + [\xi^{-1} + 1]^{0.5}$

c) $\xi^{-2} + [\xi^{-1} + 1]^{0.5}$

d) $\xi^{-1} + [\xi^{-2} + 1]^{0.5}$ ANS : D

37. ………. is the simplest to digitizing an analog filter into digital filter by approximating the differential equation by a equivalent difference equation.

a) The Impulse Invariant method

b) Matched z-transform method

c) The Bilinear transformation method

d) Approximation of derivatives ANS: D

38. Aliasing problem can be solved by………method.

a) The Impulse Invariant method

b) Matched z-transform method

c) The Bilinear transformation method

d) Approximation of derivatives ANS: C

39. Aliasing problem occurs in …………...

a) The Impulse Invariant method

b) Matched z-transform method

c) The Bilinear transformation method

d) Both a and b ANS: D

40. …………….Maps the left-half s-plane into the inside of the unit-circle in z

a) The Impulse Invariant method

b) Matched z-transform method

c) The Bilinear transformation method

d) Approximation of derivatives ANS: C

PART B

1. Which of the following is true in the case of Butterworth filters?

a) Smooth pass band

b) Wide transition band

c) Not so smooth stop band

d) All of the mentioned ANS: D

2. What is the magnitude frequency response of a Butterworth filter of order N and cutoff frequency Ω_C?

a) $1/[\sqrt{(1+(\Omega/\Omega_c)^{2N}})]$

b) $1/[(1+(\Omega/\Omega_c)^{2N})]$

c) $[\sqrt{(1+ (\Omega_/ \Omega_c)^{2N})}]$

d) None of the mentioned ANS: A

3. What is the factor to be multiplied to the dc gain of the filter to obtain filter magnitude at cutoff frequency?

a) 1

b) $\sqrt{2}$

c) $1/\sqrt{2}$

d) 1/2 ANS: C

4. What is the value of magnitude frequency response of a Butterworth low pass filter at $\Omega=0$?

a) 0

b) 1

c) $1/\sqrt{2}$

d) None of the mentioned ANS:B

5. As the value of the frequency Ω tends to ∞, then $|H(j\Omega)|$ tends to

a) 0

b) 1

c) ∞

d) None of the mentioned ANS: A

6. What is the transfer function of magnitude squared frequency response of the normalized low pass Butterworth filter?

a) $1/[(1+(S_/j)^{2N})]$

b) $[(1+ (S_/ j)^{-2N})]$

c) $[(1+ (S_/ j)^{2N})]$

d) $1/[(1+ (S_/ j)^{-2N})]$ ANS: A

7. Where does the poles of the transfer function of normalized low pass Butterworth filter exists?

a) Inside unit circle

b) Outside unit circle

c) On unit circle

d) None of the mentioned ANS:C

8. Which of the following is a frequency domain specification?

a) $0 \geq 20 \log|H(j\Omega)|$

b) $20 \log|H(j\Omega)| \geq KP$

c) $20 \log|H(j\Omega)| \leq KS$

d) All of the mentioned ANS: D

9. What is the lowest order of the Butterworth filter with a pass band gain K_P=-1 dB at Ω_P=4 rad/sec and stop band attenuation greater than or equal to 20dB at Ω_S = 8 rad/sec?

a) 4

b) 5

c) 6

d) 3 ANS : B

10. Which of the following defines a chebyshev polynomial of order N, $T_N(x)$?

a) $\cos(N\cos^{-1}x)$ for all x

b) $\cosh(N\cosh^{-1}x)$ for all x

c) $\cos(N\cos^{-1}x)$ for all $|x| < 1$; $\cosh(N\cosh^{-1}x)$ for all $|x| > 1$

d) None of the mentioned ANS: C

11. What is the value of chebyshev polynomial of degree 0?

a) 1

b) 0

c) -1

d) 2 ANS : A

12. What is the value of chebyshev polynomial of degree 1?

a) 1

b) X

c) -1

d) –x ANS: B

13. What is the value of chebyshev polynomial of degree 3?

a) $3x^3+4x$

b) $3x^3-4x$

c) $4x^3+3x$

d) $4x^3-3x$

14. What is the value of chebyshev polynomial of degree 5?

a) $16x^5+20x^3-5x$

b) $16x^5+20x^3+5x$

c) $16x^5-20x^3+5x$

d) $16x^5-20x^3-5x$ ANS: C

15. Chebyshev polynomials of odd orders are

a) Even functions

b) Odd functions

c) Exponential functions

d) Logarithmic functions ANS : B

16. What is the Butterworth polynomial of order 3?
a) $(s^2+s+1)(s-1)$
b) $(s^2-s+1)(s-1)$
c) $(s^2-s+1)(s+1)$
d) $(s^2+s+1)(s+1)$ ANS : D

17. What is the pass band edge frequency of an analog low pass normalized filter?
a) 0 rad/sec
b) 0.5 rad/sec
c) 1 rad/sec
d) 1.5 rad/sec ANS: C

18. If H(s) is the transfer function of a analog low pass normalized filter and Ω_u is the desired pass band edge frequency of new low pass filter, then which of the following transformation has to be performed?
a) $s \to s/\Omega_u$
b) $s \to s.\Omega_u$
c) $s \to \Omega_u/s$
d) none of the mentioned ANS: A

19. Which of the following is a low pass-to-high pass transformation?
a) $s \to s / \Omega_u$
b) $s \to \Omega_u / s$
c) $s \to \Omega_u.s$
d) none of the mentioned ANS: B

20. The frequencies Ω and ω are linearly related in …………………..

e) The Impulse Invariant method

f) Matched z-transform method

g) The Bilinear transformation method

h) Approximation of derivatives ANS: A

21. ……………. Method is used if both poles and zeros are involved in the analog transfer function.

a) The Impulse Invariant method

b) Matched z-transform method

c) The Bilinear transformation method

d) Approximation of derivatives ANS: B

UNIT III

PART A

1. The impulse response $h(n) = a^n u(n)$ represents a……….

a) IFR FILTER

b) IIR FILTER

c) FLR FILTER

d) FIR FILTER ANS: B

2. The impulse response h(n) = u(n)-u(n-5) represents a……….

a) IFR FILTER

b) IIR FILTER

c) FLR FILTER

d) FIR FILTER ANS: D

3. The impulse response h(n) = {1,-1,1,2,-3} represents a……….

a) FIR FILTER

b) IIR FILTER

c) FLR FILTER

d) FTR FILTER ANS: A

4. The FIR filter is a …………….filter

a) UNSTABLE

b) STABLE

c) NON-CAUSAL

d) RECURSSIVE ANS: B

5. A digital filter structure is said to be ………… if the number of delays in the block diagram representation is equal to the order of the transfer function

a) NON-CANONIC

b) LATTICE

c) LINEAR PHASE

d) CANONIC ANS: D

6. It is always possible to design FIR digital filters with ……………………….phase

a) APPROXIMATE LINEAR

b) EXACT LINEAR

c) NON-LINEAR

d) PARABOLIC ANS: B

7. The order of the FIR transfer function is usually …………….than that of an IIR transfer function meeting the same frequency response specification.

a) LOWER

b) MUCH LOWER

c) MUCH HIGHER

d) HIGHER ANS: C

8. An FIR filter of order *N* is characterized by ……… coefficients and, in general, require ……….. multipliers and ………… two-input adders

a) N-1,N+1,N+1

b) N+1,N,N

c) N+1,N+1,N

d) N+1,N-1,N ANS: C

9. In Gibb's phenomenon, the ringing effect is predominantly present near the ______ .

a. bandgap
b. bandedge
c. bandwidth
d. bandshell ANS:B

10. Which window function is also regarded as 'Raised-cosine window'?

a. Hamming window
b. Hanning window
c. Barlett window
d. Blackman window ANS:B

11. Consider the assertions given below. Which among them is an advantage of FIR Filter?

a. Necessity of computational techniques for filter implementation
b. Requirement of large storage

c. Incapability of simulating prototype analog filters
d. Presence of linear phase response ANS: D

12. A filter is said to be linear phase filter if the phase delay and group delay are _______

a. High
b. Moderate
c. Low
d. Constant ANS: D

13. Basically, group delay is the delayed response of filter as a function of ________.

a. Phase
b. Amplitude
c. Frequency
d. All of the above ANS: C

14. FIR filters ________

A. are non-recursive
B. do not adopt any feedback
C. are recursive
D. use feedback

a. A & B
b. C & D
c. A & D
d. B & C ANS: A

15. Which among the following represent/s the characteristic/s of an ideal filter?

a. Constant gain in passband
b. Zero gain in stop band
c. Linear Phase Response
d. All of the above ANS: D

16. In linear phase realization, equal valued coefficients are taken common for reducing the requisite number of ________.

a. adders
b. subtractors
c. multipliers
d. dividers ANS: C

17. In FIR filters, which among the following parameters remains unaffected by the quantization effect?

a. Magnitude Response
b. Phase Characteristics
c. Both a and b
d. None of the above ANS: B

18. Which of the following condition should the unit sample response of a FIR filter satisfy to have a linear phase?
a) h(M-1-n) n=0,1,2…M-1
b) ±h(M-1-n) n=0,1,2…M-1
c) -h(M-1-n) n=0,1,2…M-1
d) None of the mentioned ANS: B

19. If H(z) is the z-transform of the impulse response of an FIR filter, then which of the following relation is true?
a) $z^{M+1}.H(z^{-1})=\pm H(z)$
b) $z^{-(M+1)}.H(z^{-1})=\pm H(z)$
c) $z^{(M-1)}.H(z^{-1})=\pm H(z)$
d) $z^{-(M-1)}.H(z^{-1})=\pm H(z)$ ANS: D

20. What is the number of filter coefficients that specify the frequency response for h(n) symmetric?
a) (M-1)/2 when M is odd and M/2 when M is even
b) (M-1)/2 when M is even and M/2 when M is odd
c) (M+1)/2 when M is even and M/2 when M is odd
d) (M+1)/2 when M is odd and M/2 when M is even ANS: D

21. What is the number of filter coefficients that specify the frequency response for h(n) anti-symmetric?
a) (M-1)/2 when M is even and M/2 when M is odd
b) (M-1)/2 when M is odd and M/2 when M is even
c) (M+1)/2 when M is even and M/2 when M is odd
d) (M+1)/2 when M is odd and M/2 when M is even ANS:B

22. Which of the following is not suitable either as low pass or a high pass filter?
a) h(n) symmetric and M odd
b) h(n) symmetric and M even
c) h(n) anti-symmetric and M odd
d) h(n) anti-symmetric and M even ANS:C

23. The anti-symmetric condition with M even is not used in the design of which of the following linear-phase FIR filter?
a) Low pass
b) High pass

c) Band pass
d) Bans stop ANS: A

24. Which of the following defines the rectangular window function of length M-1?
a)

w(n)=1, n=0,1,2...M-1

=0, else where

b)

w(n)=1, n=0,1,2...M-1

=-1, else where

c)

w(n)=0, n=0,1,2...M-1

=1, else where

d)None of the mentioned ANS: A

25. What is the width of the main lobe of the frequency response of a rectangular window of length M-1?
a) π/M
b) 2π/M
c) 4π/M
d) 8π/M ANS: C

26. What is the approximate transition width of main lobe of a Hamming window?
a) 4π/M
b) 8π/M
c) 12π/M
d) 2π/M ANS: B

27. What is the peak side lobe (in dB) for a rectangular window?
a) -13
b) -27
c) -32
d) -58 ANS: A

28. What is the peak side lobe (in dB) for a Hanning window?
a) -13
b) -27
c) -32
d) -58 ANS: C

29. How does the frequency of oscillations in the pass band of a low pass filter varies with the value of M?
a) Decrease with increase in M
b) Increase with increase in M
c) Remains constant with increase in M
d) None of the mentioned ANS: B

30. The large side lobes of W(ω) results in which of the following undesirable effects?
a) Circling effects
b) Broadening effects
c) Ringing effects
d) None of the mentioned ANS:C

31. To reduce side lobes, in which region of the filter the frequency specifications have to be optimized?
a) Stop band
b) Pass band
c) Transition band
d) None of the mentioned ANS: C

32. Which of the following is introduced in the frequency sampling realization of the FIR filter?
a) Poles are more in number on unit circle
b) Zeros are more in number on the unit circle
c) Poles and zeros at equally spaced points on the unit circle
d) None of the mentioned ANS: C

33. Why is it desirable to optimize frequency response in the transition band of the filter?
a) Increase side lobe
b) Reduce side lobe
c) Increase main lobe
d) None of the mentioned ANS: B

34. The given equation represents the z transform of

$$H(Z) = \sum_{n=0}^{N-1} h(n).Z^{-n}$$

a) Causal and Unstable filter
b) Non-Causal and Stable filter
c) Non-Causal and Unstable filter
d) Causal and stable filter ANS: D

35. The given equation represents……………….

$$hd(n) = \frac{1}{2\pi} \int_{-\pi}^{\pi} Hd(e^{j\omega}).e^{j\omega n}\, d\omega$$

a) DFT
b) IDTFT
c) IDFT
d) DTFT ANS: B

PART B

1. The given response is ………….. filter

$$Hd(e^{j\omega}) = \begin{cases} 1.e^{-j\omega\alpha} & for\ |\omega| \leq \omega c \\ 0 & otherwise \end{cases}$$

a) Low Pass filter
b) Linear phase Low Pass filter
c) High Pass filter
d) Linear Phase High Pass filter ANS: B

2. The given response is ………….. filter

$$Hd(e^{j\omega}) = \begin{cases} 1.e^{-j\omega\alpha} & for\ \omega c \leq |\omega| \leq \pi \\ 0 & otherwise \end{cases}$$

a) Low Pass filter
b) Linear phase Low Pass filter
c) High Pass filter
d) Linear Phase High Pass filter ANS: D

3. The given response is ………….. filter

$$Hd(e^{j\omega}) = \begin{cases} 1.e^{-j\omega\alpha} & for\ \omega c1 \leq |\omega| \leq \omega c2 \\ 0 & otherwise \end{cases}$$

a) Low Pass filter
b) Linear phase Band Pass filter
c) High Pass filter
d) Linear Phase Band Stop filter ANS: B

4. The given response is ………….. filter

$$Hd(e^{j\omega}) = \begin{cases} 1.e^{-j\omega\alpha} & for\ |\omega| \leq \omega c1; \omega c2 \leq |\omega| \leq \pi \\ 0 & otherwise \end{cases}$$

a) Low Pass filter
b) Linear phase Band Pass filter
c) High Pass filter
d) Linear Phase Band Stop filter ANS: D

5. The given response is ………….. filter

$$Hd\left(e^{j\omega}\right) = \begin{cases} 1 & for\ \omega c \leq |\omega| \leq \pi \\ 0 & otherwise \end{cases}$$

a) Low Pass filter
b) Linear phase Low Pass filter
c) High Pass filter
d) Linear Phase High Pass filter ANS: C

6. The given response is ………….. filter

$$Hd\left(e^{j\omega}\right) = \begin{cases} 1 & for\ \omega c1 \leq |\omega| \leq \omega c2 \\ 0 & otherwise \end{cases}$$

a) Low Pass filter
b) Linear phase Low Pass filter
c) Band Pass filter
d) Linear Phase High Pass filter ANS: C

7. The causal transfer function H'(Z) can be obtained by the formula

a) $Z^{(N-1)/2}$. H(Z)
b) $Z^{-(N-1)/2}$. H(Z)
c) $Z^{-(N+1)/2}$. H(Z)
d) $Z^{-(N+1)/2}$. H(Z) ANS: B

8. The given expression is the impulse response of ……………………..filter

$$hd(n) = \begin{cases} \dfrac{\sin(\omega c n)}{n\pi} & for - \infty \leq n \leq \infty; n \neq 0 \\ \dfrac{\omega c}{\pi} & for\ n = 0 \end{cases}$$

a) Low Pass filter
b) Linear phase Low Pass filter
c) Band Pass filter
d) Linear Phase High Pass filter ANS: A

9. The given expression is the impulse response of ……………………..filter

$$hd(n) = \begin{cases} \dfrac{-\sin(\omega c n)}{n\pi} & for -\infty \leq n \leq \infty; n \neq 0 \\ 1 - \dfrac{\omega c}{\pi} & for\ n = 0 \end{cases}$$

a) Low Pass filter
b) Linear phase Low Pass filter
c) High Pass filter
d) Linear Phase High Pass filter ANS: C

10. The given expression is the impulse response of ……………………..filter

$$hd(n) = \begin{cases} \dfrac{\sin(\omega c2n) - \sin(\omega c1n)}{n\pi} & for -\infty \leq n \leq \infty; n \neq 0 \\ \dfrac{\omega c2 - \omega c1}{\pi} & for\ n = 0 \end{cases}$$

a) Low Pass filter
b) Linear phase Low Pass filter
c) Band Pass filter
d) Linear Phase High Pass filter ANS: C

11. The given expression is the impulse response of ……………………..filter

$$hd(n) = \begin{cases} \dfrac{\sin(\omega c1n) - \sin(\omega c2n)}{n\pi} & for -\infty \leq n \leq \infty; n \neq 0 \\ 1 - \dfrac{\omega c2 - \omega c1}{\pi} & for\ n = 0 \end{cases}$$

a) Low Pass filter
b) Linear phase Low Pass filter
c) Band Pass filter
d) Band Stop filter ANS: D

12. The given windowing function is………………………

$$wH(n) = \begin{cases} 0.5 + 0.5(cos(2\pi n/(N-1)) & for -\dfrac{N-1}{2} \leq n \leq \dfrac{N-1}{2} \\ 0 & otherwise \end{cases}$$

a) Retangular
b) Hamming

c) Hannning

d) Triangular ANS: C

13. The given windowing function is……………………..

$$wH(n) = \begin{cases} 0.54 + 0.46(cos(2\pi n/(N-1)) & for -\dfrac{N-1}{2} \leq n \leq \dfrac{N-1}{2} \\ 0 & otherwise \end{cases}$$

a) Retangular

b) Hamming

c) Hannning

d) Triangular ANS: B

14. The given windowing function is……………………..

$$w(n) = \begin{cases} 1 & for -\dfrac{N-1}{2} \leq n \leq \dfrac{N-1}{2} \\ 0 & otherwise \end{cases}$$

a) Retangular

b) Hamming

c) Hannning

d) Triangular ANS: A

15. Abrupt truncation of infinite series is done is………

a) Windowing

b) Fourier Series

c) Frequency Sampling

d) Aliasing ANS: B

16. What is the formula for calculating α (alpha) in linear phase FIR filter?

a) (N+1}/2

b) (N-1}/2

c) (2N-1}/2

d) (N+1}/3 ANS: B

17. The given response is ………….. filter

$$Hd\left(e^{j\omega}\right) = \begin{cases} 1 & for\ \ \omega c \leq |\omega| \leq \pi \\ 0 & otherwise \end{cases}$$

a) Low Pass filter

b) Linear phase Low Pass filter

c) Band Pass filter
d) High Pass filter ANS: D

18. The given response is ………….. filter

$$Hd\left(e^{j\omega}\right) = \begin{cases} 1 \quad for\ |\omega| \le \omega c1; \omega c2 \le |\omega| \le \pi \\ \qquad\qquad 0\ \ otherwise \end{cases}$$

a) Low Pass filter
b) Linear phase Low Pass filter
c) Band Stop filter
d) High Pass filter ANS: C

19. The given expression is the impulse response of ……………………..filter

$$hd(n) = \begin{cases} \dfrac{\sin\left(\omega c(n-\alpha)\right)}{\pi(n-\alpha)} & for - \infty \le n \le \infty; n \ne \alpha \\ \dfrac{\omega c}{\pi} & for\ n = \alpha \end{cases}$$

a) Low Pass filter
b) Linear phase Low Pass filter
c) Band Pass filter
d) Linear Phase High Pass filter ANS: B

20. The given expression is the impulse response of ……………………..filter

$$hd(n) = \begin{cases} \dfrac{\sin\left(\omega c1(n-\alpha)\right) - \sin\left(\omega c2(n-\alpha)\right)}{\pi(n-\alpha)} & for - \infty \le n \le \infty; n \ne \alpha \\ 1 - \dfrac{\omega c2 - \omega c1}{\pi} & for\ n = \alpha \end{cases}$$

a) Low Pass filter
b) Linear phase Low Pass filter
c) Band Pass filter
d) Linear Phase Band Stop filter ANS: B

UNIT IV

PART A

1. The effects caused due to finite word lengths are1) Coefficient quantization error2) Adder overflow limit cycle3) Round off noise4) Limit cycles.

a) 1, 2 and 3 are correct
b) 1 and 3 are correct
c) 1 and 4 are correct
d) All the four are correct ANS:D

2 .The error in the filter output that results from rounding calculations within the filter

is called

a. Coefficient quantization error

b. Adder overflow limit cycle

c. Round off noise

d. Limit cycles ANS: C

3. How is/are the roundoff errors reduced in the digital FIR filter?

a. By representation of all products with double-length registers
b. By rounding the results after acquiring the final sum
c. Both a and b
d. None of the above ANS: C

4. How is/are the roundoff errors reduced in the digital FIR filter?

a. By representation of all products with double-length registers
b. By rounding the results after acquiring the final sum
c. Both a and b
d. None of the above ANS:C

5. Which is/are the correct way/s for the result quantization of an arithmetic operation?

a. Result Truncation
b. Result Rounding
c. Both a and b
d. None of the above ANS: C
6. How is the sensitivity of filter coefficient quantization for FIR filters?

a. Low
b. Moderate

c. High
d. Unpredictable ANS: A
6. The quantization noise can be reduced

a. by increasing step size

b. by reducing step size

c. by reducing no.of bits used for quantization

d. by increasing no of bits used for quantization ANS: B

7. The advantage of cascade realization is …………..

a) Quantization error can be minimized

b) Random error can be minimized

c) System error can be minimized

d) None of the above ANS:A

8. Limit cycle is …………………..

a) Zero input limit cycle

b) Overflow limit cycle

c) Both zero input and overflow limit cycle

d) None of the above ANS: C

9. The error in the filter output that results from rounding or truncating calculations within the filter is called

a. Coefficient quantization error

b. Adder overflow limit cycle

c. Round off noise

d. Limit cycles ANS: C

10. ………………………… occurs as a result of the quantization effects in multiplication

a. Coefficient quantization error

b. Adder overflow limit cycle

c. Round off noise

d. Limit cycles ANS: D

11. The conversion of continuous time input signal into digital value produces an error, which is known as……….

a. Coefficient quantization error

b. Adder overflow limit cycle

c. Input quantization error

d. Limit cycles ANS: C

12. …………………..does not arise in floating point arithmetic

a. Underflow

b. overflow

c. Oscillation

d. None of the above ANS: B

13. The amplitudes of output during a limit cycle are confined to the range of values that iscalled the....................... of the filter

a. Pass Band

b. Stop Band

c. Dead Band

d. Transition Band ANS: C

14. ....Is a process of discarding all bits less significant than LSB that is retained

a. Rounding

b. Truncation

c. Trimming

d. Sampling ANS: B

15. The error in the filter output that results from storing the filter co-efficients is called...........

a. Coefficient quantization error

b. Adder overflow limit cycle

c. Round off noise

d. Limit cycles ANS: A

16. The method to prevent overflow limit cyle oscillations is...................

a. Rounding

b. Truncation

c. Scaling

d. Sampling ANS: C

17. . ...Is a process of considering the bits less than the LSB for quantization

a. Rounding

b. Truncation

c. Trimming

d. Sampling ANS: A

18. How is the sensitivity of filter coefficient quantization for FIR filters?

a. Low

b. Moderate

c. High

d. Unpredictable ANS : A

19. The error occurring because of fixed memory size

a. Finite word length effects

b. Adder overflow limit cycle

c. Round off noise

d. Coefficient quantization error ANS : A

20. In storing filter coefficients the quantization employed is

a. Rounding

b. Truncation

c. Trimming

d. Sampling ANS: B

PART B

1. The shift in pole location is minimized by quantization by using

a. Direct Form I

b. Direct Form II

c. Cascade Form

d. Parallel ANS: C

2. The quantization step size is given by the formula……….

a. $q = R/(2^{b+1})$

b. $q = R/(2^{b-1})$

c. $q = R/(2^{b})$

d. $q = R/(2^{-b})$ ANS: A

3. The steady state noise power due to input quantization is …………

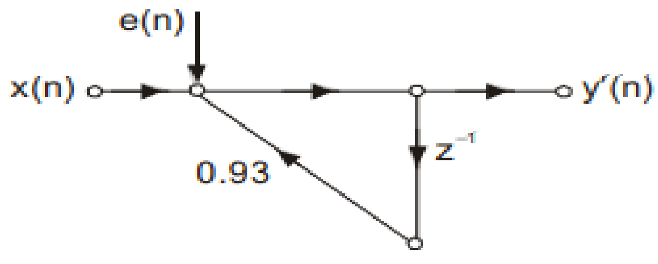
a. $q^2/10$

b. $q^3/12$

c. $q^2/14$

d. $q^2/12$ ANS: D

4. The difference equation of the given graph is……..



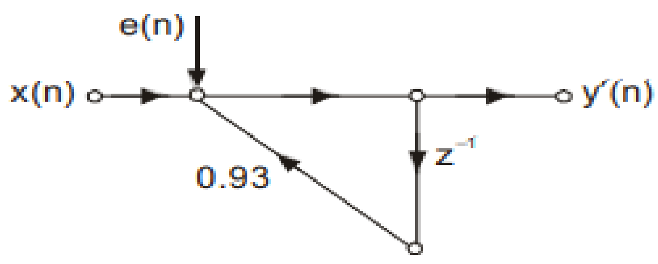
a. $y(n) = x(n) - 0.93y(n-1)$

b. $y(n) = x(n) + 0.93y(n-1)$

c. $y(n) = -x(n) - 0.93y(n-1)$

d. $y(n) = -x(n) + 0.93y(n-1)$ANS: B

5. The transfer function of the given graph is……..



a. $H(Z) = 1/(1-0.93Z^{-1})$

b. $H(Z)= 1/(1+0.93Z^{-1})$

c. $H(Z)= -1/(1-0.93Z^{-1})$

d. $H(Z)= -1/(1+0.93Z^{-1})$ANS: A

6. In fixed point arithmetic the multiplication of 2 ‘b’ bit binary numbers results in ….bits

a. b

b. b+1

c. 2b

d. b^2 ANS: D

7. In fixed point arithmetic the addition of 2 ‘b’ bit binary numbers results in ….bits

a. b

b. b+1

c. 2b

d. b-1 ANS: b

8. The output occurring even when input is zero due to quantization is called………

a. Finite word length effects

b. Adder overflow limit cycle

c. Zero limit cycle

d. Coefficient quantization error ANS : C

9. The scaling factor is given by the formula

a. $s_o^2 = 1/2.I$

b. $s_o^2 = 1/I$

c. $s_o^2 = 1/I^3$

d. $s_o^2 = 1/I^2$ ANS: B

10. The error due to quantization using rounding is in the range

a. $-q \le e \le q/2$

b. $-q/2 \le e \le q$

c. $-q/2 \le e \le q/2$

d. $-q \le e \le q$ ANS: C

11. The error due to quantization using truncation is in the range

a. $-q \le e \le 0$

b. $-q/2 \le e \le 0$

c. $-q/2 \le e \le q/2$

d. $-q \le e \le q$ANS: A

UNIT V

PART A

1) The interface between an analog signal and a digital processor is

a. D/A converter

b. A/D converter

c. Modulator

d. Demodulator ANS : B

2) The speech signal is obtained after

a. Analog to digital conversion

b. Digital to analog conversion

c. Modulation

d. Quantization ANS: B

3. Telegraph signals are examples of

a. Digital signals

b. Analog signals

c. Impulse signals

d. Pulse train ANS: A

4. As compared to the analog systems, the digital processing of signals allow

1) Programmable operations

2) Flexibility in the system design

3) Cheaper systems

4) More reliability

a. 1, 2 and 3 are correct

b. 1 and 2 are correct

c. 1, 2 and 4 are correct

d. All the four are correct ANS: D

5. Which units are generally involved in Multiply and Accumulate (MAC)?

a. Adder

b. Multiplier

c. Accumulator

d. All of the above ANS:D

6. 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 ANS : A

7. .... is a type of processor which is generally used to process real time data.

a. FPGA

b. ASIC

c. GPP

d. DSP ANS : D

8. A DSP processor does the operations like....

a. FFT

b. CONVOLUTION

c. DIGITAL FILTERING

d. ALL THE ABOVE ANS : D

9.Which is not a characteristic of DSP processor?

a. HIGH FLEXIBILITY

b. SHORT DEVELOPMENT TIME

c. HIGH POWER CONSUMPTION

d. GOOD PERFORMANCE ANS : C

10. CSSU stands for................

a. COMPARE SELECT AND STOP UNIT

b. COMPARE SELECT AND STORE UNIT

c. CONVOLVE SELECT AND STORE UNIT

d. CONVOLVE SELECT AND STOP UNIT ANS : B

11. Single Program and Data memory present in ....architecture.

a. VON NEUMANN

b. HARWARD

c. SUPER HARWARD

d. SUPER SCALAR ANS : A

12. Seperate Program and Data memory present in ....architecture.

a. VON NEUMANN

b. HARWARD

c. SUPER HARWARD

d. SUPER SCALAR ANS : B

13. Cache memory is present in...............architecture.

a. VON NEUMANN

b. HARWARD

c. SUPER HARWARD

d. SUPER SCALAR ANS : C

14. MAC Unit stands for..........

a. MULTIPLIER AND ADDER

b. MULTIPLIER AND ACCUMULATOR

c. MODULATOR AND ADDER

d. MODULATOR AND ACCUMULATOR ANS : B

15.. ......a technique which allows two or more operations to overlap during execution.

a. PARALLEL PROCESSING

b. PIPELINING

c. SCALING

d. EXPANDING ANS : B

16. VLIW and SIMD are supported by ....architecture.

a. VON NEUMANN

b. HARWARD

c. SUPER HARWARD

d. SUPER SCALAR ANS : C

17. The range of data in a c5x DSP processor is ....

a. -127 to + 127

b. -128 to + 128

c. -127 to + 128

d. -128 to + 127ANS : D

18. In hardware circular addressing minimum...............pointers are required

a. 1

b. 3

c. 2

d. 4 ANS : C

19. VLIW stands for………..

a. VERY LOCAL INSTRUCTION WORD

b. VERY LONG INSTRUCTION WORD

c. VERY LARGE INSTRUCTION WORD

d. VERY LENGTHY INSTRUCTION WORD ANS : B

20. SIMD stands for……………

a. SUPER INSTRUCTION MULTIPLE DATA

b. SINGLE INSTRUCTION MANY DATA

c. SINGLE INSTRUCTION MULTIPLE DATA

d. SCALAR INSTRUCTION MULTIPLE DATA ANS : C

PART B

1. The device in the DSP processor that takes are of external request

a. Memory cache

b. Multiplier Unit

c. DMA Controller

d. Barrel Shifter ANS : C

2. The pipelining stages DSP processor having 3 stages are………

a. Forward, Decode, Execute

b. Fetch, Decode, Execute

c. Forward, Read, Execute

d. Fetch, Read, Execute ANS : B

3. In saturation arithmetic the operation 64 + 69 is…………….

a. 133

b. 128

c. 127

d. 129 ANS : C

4. In saturation arithmetic the operation -127-5 is…………….

a. -132

b. -128

c. -127

d. -129 ANS : B

5. In saturation arithmetic the operation (64 + 70) – 25 is…………….

a. 102

b. 109

c. 110

d. 111 ANS : A

6. Which of the following is not a typical DSP feature?

a. Dedicated multiplier/MAC

b. Von Neumann memory architecture

c. Pipelining

d. Saturation Arithmetic ANS : B

7. Which implementation would you choose for lowest power consumption?

a. ASIC

b. FPGA

c. DSP

d. GPP ANS : B

8.The C8X series of DSP processor is…

a. Fixed Point Processor

b. Floating Point Processor

c. Multiprocessor

d. Uniprocessor ANS : C

9. The C54X series of DSP processor is…

a. Fixed Point Processor

b. Floating Point Processor

c. Multiprocessor

d. Uniprocessor ANS : A

10. The C3X series of DSP processor is…

a. Fixed Point Processor

b. Floating Point Processor

c. Multiprocessor

d. Uniprocessor ANS : B

UNIT I
PART A

1. If X(k) discrete Fourier transform of x(n), then the inverse discrete Fourier transform of X(k) is?

   a) $\frac{1}{N}\sum_{k=0}^{N-1} X(k)e^{-j2\pi kn/N}$

   b) $\sum_{k=0}^{N-1} X(k)e^{-j2\pi kn/N}$

   c) $\sum_{k=0}^{N-1} X(k)e^{j2\pi kn/N}$

   d) $\frac{1}{N}\sum_{k=0}^{N-1} X(k)e^{j2\pi kn/N}$

   Answer: d

2. If x(n) is a finite duration sequence of length L, then the discrete Fourier transform X(k) of x(n) is given as ____________

   a) $\sum_{k=0}^{N-1} X(k)e^{-j2\pi kn/N}$ (L<N)(k=0,1,2…N-1)

   b) $\sum_{k=0}^{N-1} X(k)e^{j2\pi kn/N}$ (L<N)(k=0,1,2…N-1)

   c) $\sum_{k=0}^{N-1} X(k)e^{j2\pi kn/N}$ (L>N)(k=0,1,2…N-1)

   d) $\sum_{k=0}^{N-1} X(k)e^{-j2\pi kn/N}$ (L>N)(k=0,1,2…N-1)

   Answer: a

3. The N^{th} rot of unity W_N is given as ______________

   a) $e^{j2\pi N}$

   b) $e^{-j2\pi N}$

   c) $e^{-j2\pi/N}$

   d) $e^{j2\pi/N}$

   Answer: c

4. Which of the following is true?

   a) $W_N^* = \frac{1}{N}W_N^{-1}$

   b) $W_N^{-1} = \frac{1}{N}W_N^*$

   c) $W_N^{-1} = W_N^*$

   d) None of the mentioned

   Answer: b

5. If $W_4^{100}=W_x^{200}$, then what is the value of x?

   a) 2

   b) 4

   c) 8

   d) 16

   Answer: c

6. If $X_1(k)$ and $X_2(k)$ are the N-point DFTs of $X_1(n)$ and $x_2(n)$ respectively, then what is the N-point DFT of $x(n)=ax_1(n)+bx_2(n)$?

a) $X_1(ak)+X_2(bk)$
b) $aX_1(k)+bX_2(k)$
c) $e^{ak}X_1(k)+e^{bk}X_2(k)$
d) None of the mentioned
Answer: b

7. In Overlap save method of long sequence filtering, what is the length of the input sequence block?
a) L+M+1
b) L+M
c) L+M-1
d) None of the mentioned
Answer: c
8. In Overlap save method of long sequence filtering, how many zeros are appended to the impulse response of the FIR filter?
a) L+M
b) L
c) L+1
d) L-1
Answer: d
9. In Overlap add method, what is the length of the input data block?
a) L-1
b) L
c) L+1
d) None of the mentioned
Answer: b
10. Which of the following is true in case of Overlap add method?
a) M zeros are appended at last of each data block
b) M zeros are appended at first of each data block
c) M-1 zeros are appended at last of each data block
d) M-1 zeros are appended at first of each data block
Answer: c
11. For a decimation-in-time FFT algorithm, which of the following is true?
a) Both input and output are in order
b) Both input and output are shuffled
c) Input is shuffled and output is in order
d) Input is in order and output is shuffled
Answer: c
12. The total number of complex multiplications required to compute N point DFT by radix-2 FFT is?
a) $(N/2)\log_2 N$
b) $N\log_2 N$
c) $(N/2)\log N$
d) None of the mentioned
Answer: a
13. In overlap save method , the convolution of various sections are performed by

a) zero padding
b) linear convolution
c) circular convolution
d) both b and c
Answer: c

14. The circular convolution of two sequences in time domain is equivalent to
a) Multiplication of DFTs of two sequences
b) Summation of DFTs of two sequences
c) Difference of DFTs of two sequences
d) Square of multiplication of DFTs of two sequences
Answer: a

15. Radix – 2 FFT algorithm performs the computation of DFT in
a) N/2Log2 N multiplications and 2Log2 N additions
b) N/2Log2 N multiplications and NLog2 N additions
c) Log2 N multiplications and N/2Log2 N additions
d) NLog2 N multiplications and N/2Log2 N additions
ANSWER: (b)

16. Which of the following is true regarding the number of computations requires to compute an N-point DFT?
a) N^2 complex multiplications and N(N-1) complex additions
b) N^2 complex additions and N(N-1) complex multiplications.
c) N^2 complex multiplications and N(N+1) complex additions
d) N^2 complex additions and N(N+1) complex multiplications
ANSWER: (a)

17. $W_N^{k+N/2}$=?
a) W_N^k
b) $-W_N^k$
c) W_N^{-k}
d) None of the mentioned
Answer: b

18. 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) L, M < N^2
Answer: c

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

20. Circular shift of an N point is equivalent to
a) Circular shift of its periodic extension and its vice versa
b) Linear shift of its periodic extension and its vice versa
c)Circular shift of its aperiodic extension and its vice versa
d) Linear shift of its aperiodic extension and its vice versa
Answer: b

21. Time shifting of discrete time signal means
a)y[n] = x[n-k]
b) y[n] = x[-n-k]
c)y[n] = -x[n-k]
d) y[n] = x[n+k]
Answer: a

22. How many numbers of butterflies are required per output point in the FFT algorithm?
a) N-1
b)N+1
c)N
d)2N
Answer: a

23. Time reversal of a discrete time signal refers to
a) y[n] = x[-n+k]
b) y[n] = x[-n]
c) y[n] = x[-n-k]
d) y[n] = x[n-k]
Answer: b

24. DIT algorithm divides the sequence into
a)Positive and negative values
b) Even and odd samples
c)Upper higher and lower spectrum
d) Small and large samples
Answer: b

25. If the arrangement is of the form in which the first row consists of the first M elements of x(n), the second row consists of the next M elements of x(n), and so on, then which of the following mapping represents the above arrangement?
a) n=l+mL
b) n=Ml+m
c) n=ML+l
d) none of the mentioned
Answer: b

UNIT I

PART B

1. What is the DFT of the four point sequence x(n)={0,1,2,3}?
   a) {6,-2+2j-2,-2-2j}
   b) {6,-2-2j,2,-2+2j}
   c) {6,-2+2j,-2,-2-2j}
   d) {6,-2-2j,-2,-2+2j}
   Answer: c

2. What is the circular convolution of the sequences $X_1(n)$={2,1,2,1} and $x_2(n)$={1,2,3,4}?
   a) {14,14,16,16}
   b) {16,16,14,14}
   c) {2,3,6,4}
   d) {14,16,14,16}
   Answer: d

3. What is the value of x(n)*h(n), 0≤n≤11 for the sequences x(n)={1,2,0,-3,4,2,-1,1,-2,3,2,1,-3} and h(n)={1,1,1} if we perform using overlap add fast convolution technique?
   a) {1,3,3,1,1,3,5,2,2,2,3,6}
   b) {1,2,0,-3,4,2,-1,1,-2,3,2,1,-3}
   c) {1,2,0,3,4,2,1,1,2,3,2,1,3}
   d) {1,3,3,-1,1,3,5,2,-2,2,3,6}
   Answer: d

4. What is the value of x(n)*h(n), 0≤n≤11 for the sequences x(n)={1,2,0,-3,4,2,-1,1,-2,3,2,1,-3} and h(n)={1,1,1} if we perform using overlap save fast convolution technique?
   a) {1,3,3,-1,1,3,5,2,-2,2,3,6}
   b) {1,2,0,-3,4,2,-1,1,-2,3,2,1,-3}
   c) {1,2,0,3,4,2,1,1,2,3,2,1,3}
   d) {1,3,3,1,1,3,5,2,2,2,3,6}
   Answer: a

5. What is the convolution of the sequences of x1(n)=x2(n)={1,1,1}?
   a) {1,2,3,2,1}
   b) {1,2,3,2,1}
   c) {1,1,1,1,1}
   d) {1,1,1,1,1}
   Answer: a

6. Given that $W=e^{-i(2\pi/N)}$, where $N=3$. Then $F=W^N$ can be computed as F=
   a)1
   b)-1
   c)0

d)e
Answer: b

7. Given that $W=e^{-i(2\pi/N)}$, where $N=3$. Then $F=W(^{N/2)}$ can be computed as F=
a)1
b)-1
c)0
d)e
Answer: c
8. Calculate the number of multiplication needed in calculation of DFT and FFT with 64 point sequence
a)4004,192
b)4096,192
c)4096,198
d)4128,192
Answer: b
9. Find the DFT of the signal x(n)=δ(n)
a) X(k)={1,0,0,0}
b) X(k)={1,0,1,0}
c) X(k)={1,1,1,1}
d) X(k)={1,0,0,1}
Answer: a

10. Determine the number of multiplication required for 8 point DFT using FFT
a)10
b)16
c)12
d)8
Answer: c
11. What is the DFT using DIF of the four point sequence x(n)={1,1,1,1,1,1,1,1}?
a)X(k)={8,0,0,0,0,0,0,0}
b) X(k)={0,0,0,8,0,0,0,0}
c) X(k)={8,0,0,0,8,0,0,0}
d) X(k)={8,0,0,0,0,0,0,8}
Answer: a

12. What is the DFT using DIF of the four point sequence x(n)={1,0,0,0,0,0,0,0}
a) X(k)={ 1,1,1,1,1,1,1,1}
b) X(k)={ 1,0,1,0,1,0,1,0}
c) X(k)={ 1,1,1,1,0,0,0,0}
d) X(k)={ 1,0,0,1,1,0,0,1}
Answer: a

13. Calculate the percentage of saving in computation through radix-2 DFT algorithm of DFT coefficient assume N=512
a)140
b)98

c)100
d)113.8
Answer: a

14. What is the circular convolution of the sequences $X_1(n)=\{1,1,2,2\}$ and $x_2(n)=\{1,2,3,4\}$?
a) {15,12,15,13}
b) {15,17,15,13}
c) {16,17,16,13}
d) {15,16,14,13}
Answer: b

15. What is the convolution of the sequences of x1(n)={1,1,2,1}x2(n)={1,2,3,4}?
a) {1,3,6,12,12,10,4}
b) {1,3,7,10,12,11,4}
c) {1,3,7,12,11,11,4}
d) {1,3,7,12,12,11,4}

Answer: d

UNIT 2

PART A

1. In IIR Filter design by the Bilinear Transformation, the Bilinear Transformation is a mapping from
a) Z-plane to S-plane
b) S-plane to Z-plane
c) S-plane to J-plane
d) J-plane to Z-plane
Answer: b
2. In the Bilinear Transformation mapping, which of the following are correct?
a) All points in the LHP of s are mapped inside the unit circle in the z-plane
b) All points in the RHP of s are mapped outside the unit circle in the z-plane
c) All points in the LHP & RHP of s are mapped inside & outside the unit circle in the z-plane
d) None of the mentioned
Answer: c
3. What is the expression for cutoff frequency in terms of pass band gain?
a) $\dfrac{\Omega_P}{(10^{-\alpha_p}-1)^{1/2N}}$
b) $\dfrac{\Omega_P}{(10^{-\alpha_p}+1)^{1/2N}}$
c) $\dfrac{\Omega_P}{(10^{\alpha_p}-1)^{1/2N}}$

d) None of the mentioned
Answer: a

4. What is the expression for the digital frequency when r=1?
a) $\frac{1}{T}\tan\left(\frac{\Omega T}{2}\right)$
b) $\frac{2}{T}\tan\left(\frac{\Omega T}{2}\right)$
c) $\frac{1}{T}\tan^{-1}\left(\frac{\Omega T}{2}\right)$
d) $\frac{2}{T}\tan^{-1}\left(\frac{\Omega T}{2}\right)$
Answer: d
5. What is the kind of relationship between Ω and ω?
a) Many-to-one
b) One-to-many
c) One-to-one
d) Many-to-many
Answer: c
6. If $s=\sigma+j\Omega$ and $z=re^{j\omega}$, then what is the condition on σ if r>1?
a) $\sigma > 0$
b) $\sigma < 0$
c) $\sigma > 1$
d) $\sigma < 1$
Answer: a
7. Which of the following substitution is done in Bilinear transformations?
a) $s=\frac{2}{T}\left[\frac{1+z^{-1}}{1-z^{-1}}\right]$
b) $s=\frac{T}{2}\left[\frac{1+z^{-1}}{1-z^{-1}}\right]$
c) $s=\frac{T}{2}\left[\frac{1-z^{-1}}{1+z^{-1}}\right]$
d) $s=\frac{2}{T}\left[\frac{1-z^{-1}}{1+z^{-1}}\right]$
Answer: d

8. Which of the following rule is used in the bilinear transformation?
a) Simpson’s rule
b) Backward difference
c) Forward difference
d) Trapezoidal rule

Answer: d

9. Which of the following filter transformation is not possible?
   a) High pass analog filter to low pass digital filter
   b) High pass analog filter to high pass digital filter
   c) Low pass analog filter to low pass digital filter
   d) None of the mentioned
   Answer: b
10. Which of the following is true relation among s-domain and z-domain?
   a) $S = \frac{(1+z)}{T}$
   b) $S = \frac{(1+z)}{T}$
   c) $S = \frac{(1-z^{-1})}{T}$
   d) $S = \frac{(1-z)}{T}$
   Answer: c

11. the direct form -I and II structure of IIR system will be identical in
   a) all poles system
   b) all zero system
   c) both a and b
   d) first order and second order systems
   Answer: c
12. The structure that uses seperates delays for input and output samples is
   a) direct form II
   b) direct form I
   c) Cascade form
   d) parallel form
   Answer: b

13. the factor that influence the choice of realization of structure is
   a) memory requirement
   b) computational complexity
   c) parallel processing and pipelining
   d) all the above
   answer d
14. The number of memory locations required to realize the system , $H(z) = \frac{1+z^{-2}+2z^{-3}}{1+z^{-2}+z^{-4}}$ is
   a)8
   b)7
   c)2
   d)10
   Answer b

15. The transformation technique in which there is one to one mapping from s-domain to z-domain is

a) Approximation of derivatives
b) Impulse invariance method
c) Bilinear transformation method
d) Backward difference for the derivative

Answer c

16. The IIR filter designing involves

a) Designing of analog filter in analog domain and transforming into digital domain
b) Designing of digital filter in analog domain and transforming into digital domain
c) Designing of analog filter in digital domain and transforming into analog domain
d) Designing of digital filter in digital domain and transforming into analog domain

Answer b

17. If δ_P is the forbidden magnitude value in the pass band and δ_S is the forbidden magnitude value in th stop band, then which of the following is true in the pass band region?

a) $1-\delta_S \le |H(j\Omega)| \le 1$
b) $\delta_P \le |H(j\Omega)| \le 1$
c) $0 \le |H(j\Omega)| \le \delta_S$
d) $1-\delta_P \le |H(j\Omega)| \le 1$

Answer d

18. The impulse invariant method is obtained by

a) Sampling the impulse response of an equivalent analog filter
b) Taking backward difference for the derivative
c) Mapping from s-domain to z-domain
d) Approximation of derivatives

Answer a

19. Low pass Butterworth filters are also called as:

a) All-zero filter
b) All-pole filter
c) Pole-zero filter
d) None of the mentioned

Answer b

20. What is the order N of the low pass Butterworth filter in terms of α_P and α_S?

a)
$$N \ge \frac{\log\left(\frac{(10^{0.1\alpha_s}-1)^{1/2}}{(10^{0.1\alpha_p}-1)^{1/2}}\right)}{\log\left(\frac{\Omega_s}{\Omega_p}\right)}$$

b) $N \geq \dfrac{\log\left(\dfrac{(10^{0.1\alpha_s}+1)^{1/2}}{(10^{0.1\alpha_p}+1)^{1/2}}\right)}{\log\left(\dfrac{\Omega_p}{\Omega_s}\right)}$

c) $N \geq \dfrac{\log\left(\dfrac{(10^{0.1\alpha_p}-1)^{1/2}}{(10^{0.1\alpha_s}-1)^{1/2}}\right)}{\log\left(\dfrac{\Omega_p}{\Omega_s}\right)}$

d) $N \geq \dfrac{\log\left(\dfrac{(10^{0.1\alpha_p}+1)^{1/2}}{(10^{0.1\alpha_s}+1)^{1/2}}\right)}{\log\left(\dfrac{\Omega_s}{\Omega_p}\right)}$

Answer a

21. What is the order N of the low pass chebychev filter in terms of α_P and α_S?

a) $N \geq \dfrac{\cosh^{-1}\left(\dfrac{\lambda}{\varepsilon}\right)}{\cosh^{-1}\left(\dfrac{\Omega_s}{\Omega_p}\right)}$

b) $N \geq \dfrac{\cosh^{-1}\left(\dfrac{\varepsilon}{\lambda}\right)}{\cosh^{-1}\left(\dfrac{\Omega_p}{\Omega_s}\right)}$

c) $N \geq \dfrac{\cosh^{-1}\left(\dfrac{\lambda}{\varepsilon}\right)}{\cosh^{-1}\left(\dfrac{\Omega_p}{\Omega_s}\right)}$

d) $N \geq \dfrac{\cosh^{-1}\left(\dfrac{\varepsilon}{\lambda}\right)}{\cosh^{-1}\left(\dfrac{\Omega_s}{\Omega_p}\right)}$

Answer a

22. The frequency warping is referred as

a) lower frequencies in analog domain expanded in digital domain
b) non linear mapping
c) compression of higher frequencies
d) all the above

Answer d

23. What is the value of chebyshev polynomial of degree 0?
a) 1
b) 0
c) -1
d) 2
Answer: a

24. What is the value of chebyshev polynomial of degree 1?
a) 1
b) x
c) -1
d) –x

Answer: b

25. What is the value of chebyshev polynomial of degree 3?
a) $3x^3+4x$
b) $3x^3-4x$
c) $4x^3+3x$
d) $4x^3-3x$
Answer: d

UNIT 2
PART B

1. What is the lowest order of the Butterworth filter with a pass band gain K_P=-1 dB at Ω_P=4 rad/sec and stop band attenuation greater than or equal to 20dB at Ω_S = 8 rad/sec?
a) 4
b) 5
c) 6
d) 3
Answer: b

2. What is the cutoff frequency of the Butterworth filter with a pass band gain K_P=-1 dB at Ω_P=4 rad/sec and stop band attenuation greater than or equal to 20dB at Ω_S=8 rad/sec?
a) 3.5787 rad/sec
b) 1.069 rad/sec
c) 6 rad/sec
d) 4.5787 rad/sec
Answer: d

3. If $H(s)=\frac{1}{s^2+s+1}$ 1 represent the transfer function of a low pass filter (not Butterworth) with a pass band of 1 rad/sec, then what is the system function of a low pass filter with a pass band 10 rad/sec?
a) $\frac{100}{s^2+10s+100}$
b) $\frac{s^2}{s^2+s+1}$

c) $\dfrac{s^2}{s^2+10s+100}$
d) None of the mentioned
Answer: a

4. If $H(s)=\dfrac{1}{s^2+s+1}$ represent the transfer function of a low pass filter (not Butterworth) with a pass band of 1 rad/sec, then what is the system function of a band pass filter with a pass band of 10 rad/sec and a center frequency of 100 rad/sec?
a) $\dfrac{s^2}{s^4+10s^3+20100s^2+10^5s+1}$
b) $\dfrac{100s^2}{s^4+10s^3+20100s^2+10^5s+1}$
c) $\dfrac{s^2}{s^4+10s^3+20100s^2+10^5s+10^8}$
d) $\dfrac{100s^2}{s^4+10s^3+20100s^2+10^5s+10^8}$
Answer: d

5. What is the stop band frequency of the normalized low pass Butterworth filter used to design a analog band pass filter with -3.0103dB upper and lower cutoff frequency of 50Hz and 20KHz and a stop band attenuation 20dB at 20Hz and 45KHz?
a) 2 rad/sec
b) 2.25 Hz
c) 2.25 rad/sec
d) 2 Hz
Answer: c

6. What is the order of the normalized low pass Butterworth filter used to design a analog band pass filter with -3.0103dB upper and lower cutoff frequency of 50Hz and 20KHz and a stop band attenuation 20dB at 20Hz and 45KHz?
a) 2
b) 3
c) 4
d) 5
Answer: b

7. Apply bilinear transformation of $H(s)=\dfrac{2}{(S+1)(S+2)}$ with T=1 sec and find H(z).
a) $H(z)=\dfrac{0.166(1+z^{-1})^2}{(1-0.33z^{-1})}$
b) $H(z)=\dfrac{0.166(1+z^{-1})}{(1-0.33z^{-1})}$
c) $H(z)=\dfrac{0.166(1-z^{-1})^2}{(1-0.33z^{-1})}$

d) $H(z)=\dfrac{0.166(1-z^{-1})^3}{(1-0.33z^{-1})^2}$

Answer: a

8. Determine H (z) using impulse invariant transformation if (a) T=1 second ,
$H(s)=\dfrac{2}{S^2+3S+2}$
a) $H(z)=\dfrac{2}{1-e^{-T}z^{-1}}-\dfrac{2}{1-e^{-2T}z^{-1}}$
b) $H(z)=\dfrac{2}{1-e^{-T}z^{-1}}+\dfrac{-2}{1-e^{-2T}z^{-1}}$
c) $H(z)=\dfrac{2}{1-e^{-T}z^{-1}}-\dfrac{-4}{1-e^{-2T}z^{-1}}$
d) $H(z)=\dfrac{4}{1-e^{-T}z^{-1}}-\dfrac{-4}{1-e^{-2T}z^{-1}}$
Answer: b

9. What is the order of the normalized low pass chebychev filter using $\Omega_P = 0.2\pi$, $\Omega_S=0.6\pi$, $\varepsilon= 0.75$ and $\lambda=4.898$
a)3
b)1
c)2
d)4
answer c
10. What is the order function of the Butterworth filter with specifications as pass band gain α_P=3dB at Ω_P=1000πrad/sec and stop band attenuation greater than or equal to 40dB at Ω_S=2000πrad/sec?
a)6
b)7
c)5
d)4
answer b
11. Obtain transfer function for the system y(n)=3/4y(n-1)-1/8y(n-2)+x(n)+1/3x(n-1)
a) $H(z)=\dfrac{1+\frac{1}{3}z^{-1}}{1-\frac{3}{4}z^{-1}+\frac{1}{8}z^{-2}}$
b) $H(z)=\dfrac{1-\frac{1}{3}z^{-1}}{1-\frac{3}{4}z^{-1}+\frac{1}{8}z^{-2}}$

c) $H(z)=\dfrac{1+\frac{1}{3}z^{-1}}{1-\frac{3}{4}z^{-1}-\frac{1}{8}z^{-2}}$

d) $H(z)=\dfrac{1-\frac{1}{3}z^{-1}}{1-\frac{3}{4}z^{-1}+\frac{1}{8}z^{-2}}$

Answer a

12. What is the transfer function of the Butterworth filter with specifications as pass band gain α_P=3dB at Ω_P=7265rad/sec and stop band attenuation greater than or equal to 10dB at Ω_S=2235rad/sec?

a) $H(s)={}^{1}\!/_{s+1}$

b) $H(s)={}^{1}\!/_{s-1}$

c) $H(s)={}^{1}\!/_{s+\sqrt{2}s+1}$

d) $H(s)={}^{1}\!/_{s+\sqrt{2}s-1}$

Answer a

13. Find the value of the a and b values of chebyshev filter ε=1, μ=2.414
a) a=950π, b=197π
b) a=910π, b=2197π
c) a=810π, b=1197π
d) a=2197π, b=910π
Answer b

14. Calculate the value of μ in a chebyshev filter, ε=0.882
a) 2
b) 3
c) 2.66
d) 3.66
Answer b

15. Find the order N of the chebyshev filter , $\varepsilon=1,\lambda=9.95,\Omega_s=4,\Omega_p=2$
a) 2
b) 4
c) 3
d) 5
Answer c

EC8553 – DISCRETE TIME SIGNAL PROCESSING

UNIT-III

FINITE IMPULSE RESPONSE DIGITAL FILTERS

PART A:

1. A Blackman window can eliminate ripple in FIR filters. The tradeoff is
   (a) larger transition bandwidth
   (b) smaller transition bandwidth
   (c) a non-linear phase response
   (d) possible instability

2. Two digital filters can be operated in cascade. Or, the same effect can be achieved by
   (a) adding their coefficients
   (b) subtracting their coefficients
   (c) convolving their coefficients
   (d) averaging their coefficients and then using a Blackman window

3. Coefficient symmetry is important in FIR filters because it provides
   (a) a smaller transition bandwidth
   (b) less passband ripple
   (c) less stopband ripple
   (d) a linear phase response

7. The impulse response of a symmetrical FIR filter is
   (a) h(n)=h(N-1)/2
   (b) h(n)=h(N-1-n)
   (c) h(n)=h(-n)/2
   (d) h(n)=h(n)/2

7. The Bandwidth of a Hanning window is
   (a) 2π/N
   (b) 6π/N
   (c) 12π/N
   (d) **8π/N**

8. The Bandwidth of a Hamming window is
   (a) 2π/N
   (b) 6π/N
   (c) 12π/N
   (d) **8π/N**

9. For the rectangular window function, the transition width of the main lobe is approximately (here M is the length of the filter)
   (a) 4*pi*M

(b) pi/4M
(c) pi*M/4
(d) 4*pi/M

10. For the rectangular window function, the first sidelobe will be ___________ dB down the peak of the main lobe.
    (a) 12 dB
    (b) 11 dB
    (c) 13 dB
    (d) 14 dB

15. The desired filter coefficient of Low pass FIR filter is
    (a) $h_d(n) = \frac{sin(n-\alpha)}{(n-\alpha)}\ for\ n \neq \alpha$

    (b) $\boldsymbol{h_d(n) = \frac{sin\omega(n-\alpha)}{\pi(n-\alpha)} for\ n \neq \alpha}$

    (c) $h_d(n) = \frac{sin\omega_c(n-\alpha)}{\pi(n-\alpha)} for\ n \neq \alpha$

    (d) $h_d(n) = \frac{sin\omega_c(n-\alpha)}{n} for\ n \neq \alpha$

16. The peak side lobe of Hamming window is
    (a) -30db
    (b) -43db
    (c) -10db
    (d) -32db

17. The peak side lobe of rectangular window is
    (a)-30db
    (b) -23db
    (c)-13db
    (d) -10db

18. The peak side lobe of Bartlett window is
    (a) -30db
    (b) -27db
    (c) -10db
    (d) -22db

19. The peak side lobe of Hanning window is
    (a) -30db
    (b) -27db
    (c) -10db

(d) **-32db**

21. The desired filter coefficient of high pass FIR filter is

(a) $h_d(n) = \frac{sin(n-\alpha)\omega_c + sin(n-\alpha)\pi}{\pi(n-\alpha)} for\ n \neq \alpha$

(b) $h_d(n) = \frac{sin(n-\alpha)\pi + sin(n-\alpha)\omega_c}{\pi(n-\alpha)} for\ n \neq \alpha$

(c) $\boldsymbol{h_d(n) = \frac{sin(n-\alpha)\pi - sin(n-\alpha)\omega_c}{\pi(n-\alpha)} for\ n \neq \alpha}$

(d) $h_d(n) = \frac{sin(n-\alpha)\omega_c - sin(n-\alpha)\pi}{\pi(n-\alpha)} for\ n \neq \alpha$

22. The desired filter coefficient of band pass FIR filter is

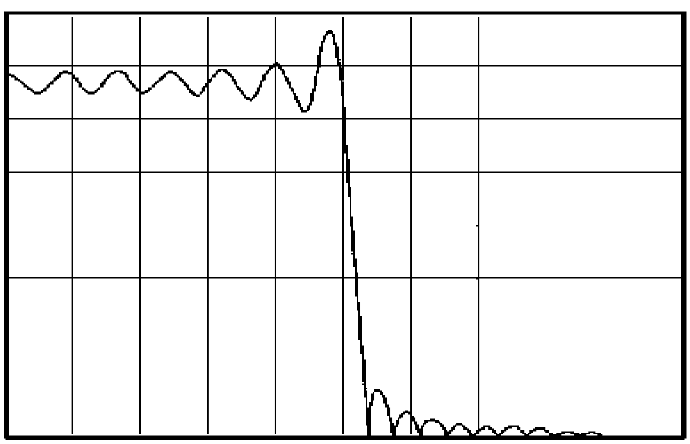
(a) $h_d(n) = \frac{sin(n-\alpha)\omega_c + sin(n-\alpha)\pi}{\pi(n-\alpha)} for\ n \neq \alpha$

(b) $h_d(n) = \frac{sin(n-\alpha)\pi + sin(n-\alpha)\omega_c}{\pi(n-\alpha)} for\ n \neq \alpha$

(c) $h_d(n) = \frac{\boldsymbol{sin(n-\alpha)\omega_{c1} - sin(n-\alpha)\omega_{c2}}}{\boldsymbol{\pi(n-\alpha)}} for\ n \neq \alpha$

(d) $\boldsymbol{h_d(n) = \frac{sin(n-\alpha)\omega_{c2} - sin(n-\alpha)\omega_{c1}}{\pi(n-\alpha)} for\ n \neq \alpha}$

23.This windowed sinc FIR filter has ripple caused by



(a) non-symmetrical coefficients
(b) **Gibb's phenomenon**
(c) too few taps

(d) a defective accumulator

24. An FIR system is described by the system function

$$H(z) = 1 + \frac{7}{2}z^{-1} + \frac{3}{2}z^{-2}$$

The system is

(a) Maximum phase
(b) Minimum phase
(c) Mixed phase
(d) Zero phase

25. If N=53 and ω_c=0.3π radians. Find α

(a) 12
(b) 26
(c) 20
(d) 4

26. If $h(n) = \begin{cases} 5 & 0 \le n \le N-1 \\ 0 & \text{elsewhere} \end{cases}$ the frequency response is

(a) $\left(\dfrac{5-e^{-j\omega N}}{5-e^{-j\omega}}\right)$

(b) $\left(\dfrac{5-e^{+j\omega N}}{5-e^{-j\omega}}\right)$

(c) $\left(\dfrac{5-e^{-j\omega N}}{5+e^{-j\omega}}\right)$

(d) $\left(\dfrac{5-e^{-j\omega N}}{5-e^{-j\omega}}\right)$

27. If $h(n) = \begin{cases} 1 & 0 \le n \le N \\ 0 & \text{elsewhere} \end{cases}$ the frequency response is

(a) $\left(\dfrac{1-e^{-j\omega N}}{1-e^{-j\omega}}\right)$

(b) $\left(\dfrac{1-e^{+j\omega N}}{1-e^{-j\omega}}\right)$

(c) $\left(\dfrac{1-e^{-j\omega N}}{1+e^{-j\omega}}\right)$

(d) $\left(\frac{1-e^{-j\omega N}}{1-e^{-j\omega}}\right)$

PART B

1.The filter with $H_d\left(e^{jw}\right) = \begin{cases} 1\, for\ \frac{\pi}{4} \leq |\omega| \leq \pi \\ 0,\ for\ |\omega| \leq \frac{\pi}{4} \end{cases}$ find $h_d(n) for\ N = 11$

(a) $h_d(n) = \frac{sin(n-\alpha)}{(n-\alpha)}$

(b) $\boldsymbol{h_d(n) = \frac{sin\pi n - sin\frac{\pi}{4}n}{\pi n}}$

(c) $h_d(n) = \frac{\sin\frac{\pi}{4}(n-\alpha)}{\pi(n-\alpha)}$

(d) $h_d(n) = \frac{sin\frac{\pi}{4}n - sin\pi n}{\pi n}$

2. The filter with $H_d\left(e^{jw}\right) = \begin{cases} e^{-i\omega\alpha}\ for\ |\omega| \leq \omega_c \\ 0,\ \ otherwise \end{cases}$ find $h_d(n) for\ N = 7$

(a) $\boldsymbol{h_d(n) = \frac{sin(n-3)}{\pi(n-3)}\ for\ n \neq 3}$

(b) $h_d(n) = \frac{sin\pi n - sin\frac{\pi}{4}n}{\pi n}\ for\ n = 3$

(c) $h_d(n) = \frac{\sin\frac{\pi}{4}(n-3)}{\pi(n-3)}$ for n≠3

(d) $h_d(n) = \frac{sin\frac{\pi}{4}n - sin\pi n}{\pi n}$ for n=3

3. The filter with $H_d\left(e^{jw}\right) = \begin{cases} e^{-i5\omega}\ \ for\ 0 \leq |\omega| \leq \omega_{c1\,,} \omega_{c2\,,} \leq |\omega| \leq \pi \\ 0,\ \ otherwise \end{cases}$

find $h_d(n) for\ N = 11, \omega_{c1\,,} = 1rad, \omega_{c2,} = 2rad, n \neq 5$

(a) $h_d(n) = \frac{sin2(n-5) + sin(n-5) - \sin(n-5)\pi}{\pi(n-5)}$

(b) $h_d(n) = \frac{sin2(n-5) - sin(n-5) + \sin(n-5)\pi}{\pi(n-5)}$

(c) $h_d(n) = \frac{sin(n-5) + sin2(n-5) - \sin(n-5)\pi}{\pi(n-5)}$

(d) $\boldsymbol{h_d(n) = \frac{sin(n-5) - sin2(n-5) + \sin(n-5)\pi}{\pi(n-5)}}$

4. Design a filter with $H_d\left(e^{jw}\right) = \begin{cases} e^{-i5\omega} & for\ \omega_{c1,} \leq |\omega| \leq \omega_{c2} \leq \pi \\ 0, & otherwise \end{cases}$

Find $h_d(n) for\ N = 9, \omega_{c1,} = 1rad, \omega_{c2,} = 2rad, n \neq 3$

(a) $h_d(n) = \frac{sin2(n-3) + \sin(n-3)\pi}{\pi(n-5)}$

(b) $h_d(n) = \frac{sin(n-3) - \sin 2(n-3)}{\pi(n-3)}$

(c) $\boldsymbol{h_d(n) = \frac{sin2(n-3) - \sin(n-3)}{\pi(n-3)}}$

(d) $h_d(n) = \frac{sin(n-3) + \sin 2(n-3)}{\pi(n-3)}$

5. Design a filter with $H_d\left(e^{jw}\right) = \begin{cases} e^{-i5\omega} & for\ 0 \leq |\omega| \leq \omega_{c1,} \omega_{c2,} \leq |\omega| \leq \pi \\ 0, & otherwise \end{cases}$ Find $h_d(5)\ for\ n = 5, \omega_{c1,} = 1rad, \omega_{c2,} = 2rad, N = 11$

(a) $h_d(n) = 0.5780$

(b) $\boldsymbol{h_d(n) = 0.68169}$

(c) $h_d(n) = 0.3182$

(d) $h_d(n) = 0.7852$

(e)

6. Design a filter with $H_d\left(e^{jw}\right) = \begin{cases} e^{-i5\omega} & for\ \omega_{c1,} \leq |\omega| \leq \omega_{c2} \leq \pi \\ 0, & otherwise \end{cases}$

Find $h_d(3) for\ n = 3, \omega_{c1,} = 1rad, \omega_{c2,} = 2rad,\ N = 9$

(a) $\boldsymbol{h_d(n) = 0.3183}$

(b) $h_d(n) = 0.6816$

(c) $h_d(n) =$0.5780

(d) $h_d(n) = 0.75$

7. Design a filter with $H_d\left(e^{jw}\right) = \begin{cases} 1\ for\ \frac{\pi}{4} \leq |\omega| \leq \pi \\ 0,\ for\ |\omega| \leq \frac{\pi}{4} \end{cases}$ Find $h_d(n) for\ n = 0, N = 11,$

(a) $h_d(0) = 0.5$

(b) $\boldsymbol{h_d(n) = 0.75}$

(c) $h_d(n) = 0.075$

(d) $h_d(n) = 0.05$

8. Design a filter with $H_d\left(e^{jw}\right) = \begin{cases} e^{-i\omega\alpha}\ for\ |\omega| \leq \omega_c \\ 0,\ \ otherwise \end{cases}$, Find $h_d(n) for\ n = 3,\ N = 7$

(a) $h_d(3) = 0.1442$

(b) $h_d(3) = 0.2678$

(c) $\boldsymbol{h_d(3) = 0.3183}$

(d) $h_d(3) = 0.0149$

9. The filter with $H_d\left(e^{jw}\right) = \begin{cases} 1\ for\ \frac{\pi}{4} \leq |\omega| \leq \pi \\ 0,\ for\ |\omega| \leq \frac{\pi}{4} \end{cases}$

$Find\ the\ hamming\ window\ coefficient\ w_{ha}(0)\ for\ -5 \leq n \leq 5$

(a) 0.912
(b) 0.682
(c)0.398
(d) 1

10. The filter with $H_d\left(e^{jw}\right) = \begin{cases} e^{-i5\omega}\ \ for\ 0 \leq |\omega| \leq \omega_{c1}, \omega_{c2}, \leq |\omega| \leq \pi \\ 0,\ \ otherwise \end{cases}$
$Find\ the\ hanning\ window\ coefficient\ w_{hn}(1)\ for\ 0 \leq n \leq 10$

(a) 1
(b) 0.0945
(c)0.345
(d) 0.655

11. The low pass filter with pass band gain of unity, cutoff frequency of 1000Hz and working at a sampling frequency of 5 KHz. $Find\ h_d\ (n)\ for\ N = 7$

(a) $\boldsymbol{h_d(n) = \frac{\sin\frac{2\pi}{5}n}{\pi n}}$

(b) $h_d(n) = \frac{\sin\frac{\pi}{5}n}{\pi n}$

(c) $h_d(n) = \frac{\sin\frac{3\pi}{5}n}{\pi n}$

(d) $h_d(n) = \frac{\sin\frac{\pi}{4}n - \sin\pi n}{\pi n}$

12.Find the coefficient h(0) of Linear Phase FIR with N=15

$$H(k) = \begin{cases} 1\ (e^{\frac{-j14\pi k}{15}})\ for\ k = 0,1,2.3 \\ 0.4\ \left(e^{\frac{-j14\pi k}{15}}\right)\ for\ k = 4, \\ 0 \qquad otherwise \end{cases}$$ using frequency sampling method.

a) 0.04
(b) -0.01412
(c)0.0122
(d) 0.3133

13. The filter with $H_d\left(e^{jw}\right) = \begin{cases} e^{-i\omega\alpha}\ for 0 \le \omega \le \frac{\pi}{2} \\ 0,\ \frac{\pi}{2} \le \omega \le \pi \end{cases}$ find $H(k) for\ N = 7$

using Frequency sampling method.

(a) $H(k) = \begin{cases} (e^{\frac{-j6\pi k}{7}})\ for\ k = 0,1,2.3 \\ 0,\ for\ k = 4,5,6, \end{cases}$

(b) $H(k) = \begin{cases} (e^{\frac{-j6\pi k}{7}})\ for\ k = 0,1 \\ 0,\ for\ k = 2,3,4,5,6 \end{cases}$

(c) $\boldsymbol{H(k) = \begin{cases} \left(e^{\frac{-j6\pi k}{7}}\right) for\ k = 0,1,6 \\ 0,\ for\ k = 2,3,4,5 \end{cases}}$

(d) $H(k) = \begin{cases} \left(e^{\frac{-j6\pi k}{7}}\right) for\ k = 0,1,2 \\ 0,\ for\ k = 3,4,5,6 \end{cases}$

14.In cascade realization of the system function $H(z) = 1 + \frac{5}{2}z^{-1} + 2z^{-2} + 2z^{-3}$ if $H_1(z) = 1 + 2z^{-1}$ Find $H_2(z)$

a) $H(z) = 1 + \frac{1}{2}z^{-1} - 2z^{-2}$
(b) $\boldsymbol{H(z) = 1 + \frac{1}{2}z^{-1} + z^{-2}}$
(c) $H(z) = 1 + z^{-1} + \frac{1}{2}z^{-2}$
(d) $H(z) = 1 - z^{-1} + \frac{1}{2}z^{-2}$

15.Realize the system function$(z) = 1 + \frac{1}{3}z^{-1} + 2z^{-2} + 2z^{-3} + \frac{1}{4}z^{-4} + 5z^{-5} + z^{-6}$ with minimum number of multipliers
(a) 6
(b) 7
(c)3
(d) 4

UNIT – IV

FINITE WORD LENGTH EFFECTS

Part A

1. Calculate the steady state noise power due to input quantization if b= 8 bits

(a) $1.2716 * 10^{-5}$
(b) $\boldsymbol{1.2716 * 10^{-6}}$
(c) $1.2716 * 10^{-4}$
(d) $1.2716 * 10^{-3}$

2. $$\sum_{n=0}^{\infty} x^2(n) =$$

$(\boldsymbol{a})$ $\boldsymbol{\frac{1}{2\pi j}\oint X(z)X(z^{-1})z^{-1}dz}$
(b) $\frac{1}{2\pi j}\oint X(z)\, z^{-1}dz$
(c) $\frac{1}{2\pi}\oint X(z)X(z^{-1})z^{-1}dz$
(d) $\frac{1}{2\pi j}\oint X(z)X(z^{-1})zdz$

3. If the range of analog signal to be quantized is R, then the quantization step size q for one's complement is given by

(a) $q = \frac{R}{2^b}$

(b) $\boldsymbol{q = \frac{R}{2^b - 1}}$

(c) $q = \frac{R}{2^b} - 1$

(d) $q = \frac{R}{2^{b-1}}$

4. If the range of analog signal to be quantized is R, then the quantization step size q for two's complement is given by

(a) $q = \frac{R}{2^b} - 1$

(b) $q = \frac{R}{2^b - 1}$

(c) $\boldsymbol{q = \frac{R}{2^b}}$

(d) $q = \frac{R}{2^{b-1}}$

5. The range of error due to rounding a number to b-bits in floating point is given by

a) $-\left(2^{-B} - 2^{-L}\right) \leq \varepsilon_T \leq 0$

(b) $-(\frac{1}{2})^{-b} \leq \boldsymbol{\varepsilon_T} \leq (\frac{1}{2})^{-b}$

(c) $(2^{-B} - 2^{-L}) \leq \varepsilon_T \leq 0$

(d) $\boldsymbol{-2^{-b} \leq \varepsilon_T \leq 2^{-b}}$

6. The range for negative truncation error for sign magnitude representation is

(a) $\boldsymbol{-\left(2^{-B} - 2^{-L}\right) \leq \varepsilon_T \leq 0}$

(b) $0 \leq \varepsilon_T \leq \left(2^{-B} - 2^{-L}\right)$

(c) $(2^{-B} - 2^{-L}) \leq \varepsilon_T \leq 0$

(d) none of the above

7. The range for positive truncation error for sign magnitude representation is

(a) $-\left(2^{-B} - 2^{-L}\right) \leq \varepsilon_T \leq 0$

(b) $\boldsymbol{0 \leq \varepsilon_T \leq \left(2^{-B} - 2^{-L}\right)}$

(c) $(2^{-B} - 2^{-L}) \leq \varepsilon_T \leq 0$

(d) none of the above

8. The range for truncation error for two's complement representation is

(a) $-\left(2^{-B} + 2^{-L}\right) \leq \varepsilon_T \leq 0$

(b) $0 \leq \varepsilon_T \leq \left(2^{-B} - 2^{-L}\right)$

(c) $\boldsymbol{-(2^{-B} - 2^{-L}) \leq \varepsilon_T \leq 0}$

(d) none of the above

9. The range for round off error for sign magnitude representation is

$(\boldsymbol{a}) - \frac{\mathbf{(2^{-B} - 2^{-L})}}{\mathbf{2}} \leq \boldsymbol{\varepsilon_R} \leq \frac{\mathbf{(2^{-B} - 2^{-L})}}{\mathbf{2}}$
(b) $0 \leq \varepsilon_T \leq (2^{-B} - 2^{-L})$
(c) $-(2^{-B} - 2^{-L}) \leq \varepsilon_T \leq 0$
(d) none of the above

10. The range for round off error for two's complement representation is
$(\boldsymbol{a}) - \frac{\mathbf{(2^{-B} - 2^{-L})}}{\mathbf{2}} \leq \boldsymbol{\varepsilon_R} \leq \frac{\mathbf{(2^{-B} - 2^{-L})}}{\mathbf{2}}$
(b) $0 \leq \varepsilon_T \leq (2^{-B} - 2^{-L})$
(c) $-(2^{-B} - 2^{-L}) \leq \varepsilon_T \leq 0$
(d) none of the above

11.Convert 20.125 into binary

a) 10100.0010
(b) 01001.0001
(c) 10100.1000
(d) 10100.0100

12. Convert -0.125 in signed magnitude form
a**)** 0.0010
(b) 0.1000
(c) 1.0010
(d) 1.10110

13.Convert -0.125 in one's complement form
a**)** 0.0010
(b) 0.1000
(c) 1.1110
(d) 1.1101

14. Power of quantization noise
(a) $\boldsymbol{P_{e(n)}} = \frac{\mathbf{2^{-2B}}}{\mathbf{12}}$

(b) $P_{e(n)} = \frac{2^{-2B}}{2}$

(c) $P_{e(n)} = \frac{2^{-B}}{12}$

(d) none of above

15. In recursive systems, if the system output enters limit cycle, it will continue to remain in limit

cycle even when the input is made zero.

(a)Overflow Limit Cycle Oscillations

(b) Saturation Arithmetic

(c)Signal Scaling

(d) Zero Input Limit Cycle Oscillations

16. Truncation or rounding of the data results in

(a) degradation of system performance

(b) increase system performance

(c) grow power

(d) Reduces signal to noise ratio

17.The four decimal approximation using rounding for X=0.110010 is

(a) 0.1110

(b) 0.1100

(c) 0.1101

(d) 1.1111

18.If X=0.011010100 and it is truncated to 4 bits we get

(a) 0.0100

(b) 0.0110

(c) 0.0101

(d) 1.0111

19.The dead band of the filter is given by the equation

(a) $K = \frac{1}{2}\left(\frac{2^{-2B}}{1-|a|}\right)$

(b) $\boldsymbol{K = \frac{1}{2}\left(\frac{2^{-B}}{1-|a|}\right)}$

(c) $K = \frac{2^{-2B}}{1-|a|}$

(d) $K = \frac{2^{-B}}{1-|a|}$

20.The scaling factor S_o to avoid overflow in adder of the digital filter is given by

(a) $\boldsymbol{S_0 = \sqrt{\frac{1}{\frac{1}{2\pi j}\oint\frac{z^{-1}dz}{D(z)D(z^{-1})}}}}$

(b) $S_0 = \sqrt{\frac{1}{\frac{1}{2\pi j}\oint\frac{z\,dz}{D(z)D(z^{-1})}}}$

(c) $S_0 = \frac{1}{\frac{1}{2\pi j}\oint\frac{z\,dz}{D(z)D(z^{-1})}}$

(d) $S_0 = \frac{1}{\frac{1}{2\pi j}\oint\frac{z^{-1}dz}{D(z)D(z^{-1})}}$

21. The process of quantization introduces

(a) error

(b) noise

(c) power
(d) variance

22. Issue connected with finite word length effects:
    (a) finite word length effects in FFTs
    (b) product quantization and coefficient quantization errors in digital filters
    (c) limit cycles in IIR filters
    (d) all of above

23. Stray filter
    (a) coefficient quantization error in Direct form realization of IIR filters
    (b) coefficient quantization error in cascaded-Direct form realization of IIR filters
    (c) coefficient quantization error in ladder form realization of IIR filters
    (d) none of above

24. Limit cycle is
    (a) zero input limit cycle
    (b) overflow limit cycle
    (c) a & b
    (d) none of above

25. Coefficient quantization effects in Direct form realization of IIR filters is
    (a) $\boldsymbol{Y'(z) = [H_{ideal}(z)X(z) + E(z)]}$
    (b) $Y'(z) = [H_{ideal}(z) + E(z)]$
    (c) $Y'(z) = [H_{ideal}(z)X(z)]$
    (d) $Y'(z) = [H_{ideal}(z)E(z) + X(z)]$

PART B

1. The filter coefficient H = -0.673 is represented by sign magnitude fixed point arithmetic. I the word length is 6 bits, compute the quantization error due to truncation.
   (a) 0.001125
   (b) 0.125
   (c) 0.0125
   (d) 0.1125

2. From the expression of the signal to quantization noise ratio calculate the improvement with an increase of 2 bits to the existing bit approximately is

(a) 8dB
(b) 6dB
(c) **12 dB**
(d) 14 dB

3. Express the fraction (-7/8) in 1's complement form
   (a) 1.111
   (b) 0.001
   (c) **1.000**
   (d) 1.001

4. Find the dead band of the given $y(n) = 0.9\ y(n-1) + x(n)$ if x(n)=0,y(-1)=12,b=3 bits
   (a) [-0.625.0.625]
   (b) **[-5,5]**
   (c) [-10,10]
   (d) [-2,2]

5. Compute the truncated $H^1\ (Z)$ with coefficients represented by 4 bit word length
   $H(Z) = \frac{1}{z=0.752352}$
   (a) $H^1\ (Z) = \frac{1}{z-0.625}$
   (b) $\boldsymbol{H^1\ (Z) = \frac{1}{z-0.75}}$
   (c) $H^1\ (Z) = \frac{1}{z-0.675}$
   (d) $H^1\ (Z) = \frac{1}{z-0.725}$

6. An IIR causal filter has the system function $H(Z) = \frac{z}{z-0.97}$ .assume that the input signal is zero valued and the computed output signal values are rounded to one decimal value. Show that under these stated conditions, the filter output exhibits dead band effect. What is the dead band range.
   (a**) [-1.66667,1.66667]**
   (b) [-4,4]
   (c) [-1,0]
   (d) [-2,2]

7. Given $H(Z) = \frac{0.5+0.4\ z^{-1}}{1-0.312z^{-1}}$ is the transfer function of a digital filter, find the scaling factor S_o to avoid overflow in adder of the digital filter .
   a**)** 0.9125
   (b) 0.9250
   (c) **0.9501**
   (d) 0.9755

8. For a second order digital filter $H(Z) = \frac{1}{1-2rcos\theta\ z^{-1} + r^2z^{-2}}$,$h(n) = \frac{r^{2n}\ sin^2(n+1)\theta}{sin^2\ \theta}$ find the scale factor S_o to avoid overflow.
   a**)** $H(Z) = \frac{1-r^2}{(1+r^2)\ (1-2r^2cos2\theta+r^4\ )}$
   (b) $\boldsymbol{H(Z) = \frac{1+r^2}{(1-r^2)\ (1-2r^2cos2\theta+r^4\ )}}$

(c) $H(Z) = \frac{1+r^2}{(1-r^2)(1+2r^2 cos2\theta - r^4)}$

(d) $H(Z) = \frac{1-r^2}{(1+r^2)(1+2r^2 cos2\theta - r^4)}$

9.The input to the system $y(n) = 0.999y(n-1) + x(n)$ is applied to an ADC. What is the power produced by the quantisation noise at the output of the filter if the input is quantized to 8 bits.

(a) $\mathbf{2.544 * 10^{-3}}$

(b) $2.125 * 10^{-3}$

(c) $2.840 * 10^{-5}$

(d) $2..625 * 10^{-3}$

10.Find the output noise power of $H(z) = \frac{1}{1-0.25z^{-1}}$ for b=8 bits

(a**)** $\mathbf{2.}544 * 10^{-3}$

(b) $2.125 * 10^{-4}$

(c) $1.2562 * 10^{-5}$

(d) $\mathbf{1.3564 * 10^{-6}}$

11. Find the effect of coefficient of quantisation for given $H(z) = \frac{1}{1-0.2z^{-1}}$ if b=3 bits

(a) $H(z) = \frac{1}{1-0.2z^{-1}}$

(b $\boldsymbol{H(z) = \frac{1}{1-0.125z^{-1}}}$

(c) $H(z) = \frac{1}{1-0.15z^{-1}}$

(d) $H(z) = \frac{1}{1-0.175z^{-1}}$

12. If x=0.1101001101 here total number of bits=9 if it is rounded to 5-bits then

a**)** 0.11010

(b) 0.11000

(c) 0.11011

(d) 0.10110

13.The floating-point representation for 6,5 is

(a**)** $\mathbf{2^{0011} * 0.1101}$

(b) $2^{0010} * 0.1001$

(c) $2^{0001} * 0.1010$

(d) $2^{0011} * 0.1100$

14.Convert -0.125 in two's complement form

a**)** 0.0010

(b) 0.1000

(c) 1.1110

(d) 1.10110

15.The floating-point representation for 3 is

(a**)** $2^{0010} * 0.1101$

(b) $\mathbf{2^{0010} * 0.1100}$

(c) $2^{0001} * 0.1010$
(d) $2^{0011} * 0.1100$

UNIT-V DSP PROCESSOR AND ITS APPLICATIONS

PART – A (25X1-25)

1. **The interface between an analog signal and a digital processor is**

   a. D/A converter
   b. A/D converter
   c. Modulator
   d. Demodulator

2. Which type of architecture uses different storage space for program code and the data?
   a) Von Neumann architecture
   b) Harvard architecture
   c) Fragmented architecture
   d) Split cell architecture

3. **Which units are generally involved in Multiply and Accumulate (MAC)?**

   a. Adder
   b. Multiplier
   c. Accumulator
   d. All of the above

4. **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

5. **How are the instructions executed in DSP Processors?**

   a. In Parallel manner
   b. In Sequential manner
   c. Both a and b
   d. None of the above

6. **In TMS 320 C5X processor, which operation/s is/are performed by Compare Select & Store Unit (CSSU)?**
a. Selection of large word in accumulator for storing into the data memory
b. Comparison between high & low word of accumulator
c. Maintain the record of transition histories
d. All of the above

7. **In ISA, Timer 0 is also regarded as ______**
a. System Timer
b. Refresh Timer
c. Speaker Timer
d. All of the above

8. In DSP Processor, what kind of queuing is undertaken/executed through instruction register and instruction cache?
a. Implicate

b. Explicate
c. Both a and b

d. None of the above

9. 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. Require less maintenance

d. Less power consumption

10. What is the reason for the need of high speed DSP?
a) Less power consumption at higher speeds
b) Better processing capabilities
c) High sampling frequency
d) Easily programmable.

11. **Which stage associated with pipelining mechanism recognizes the instruction that is to be executed?**
a. Fetch
b. Decode
c. Execute
d. None of the above

12. **In CPU structure, what kind of instruction to be executed is held by an instruction Register (IR)?**
a. Current (present)

b. Previous
c. Next
d. All of the above

13. **In CPU structure, where is one of the operand provided by an accumulator in order to store the result?**
a. Control Unit

b. Arithmetic Logic Unit
c. Memory Unit
d. Output Unit

14. **In Von Neumann architecture, which among the following handles all the operations of the system that are inside and outside the processor?**
a. Input Unit

b. Output Unit
c. Control Unit
d. Memory Unit

15. **How is the nature of instruction size in CISC processors?**
a. Fixed

b. Variable
c. Both a and b
d. None of the above

16. Howmany buses are there in c50 DSP processor?
    a) 2
    b) 4
    c) 6
    d) 8
17. For a given number of bits, the power of quantization noise is proportional to the variance of the signal to be quantized.
    a) True
    b) False
18. There is no requirement to process the various signals at different rates commensurate with the corresponding bandwidths of the signals.
    a) True
    b) False
19. Which of the following methods are used in sampling rate conversion of a digital signal?
    a) D/A convertor and A/D convertor
    b) Performing entirely in digital domain
    c) None of the mentioned
    d) D/A convertor, A/D convertor & Performing entirely in digital domain

20. In which of the following, sampling rate conversion are used?
    a) Narrow band filters
    b) Digital filter banks
    c) Quadrature mirror filters
    d) All of the mentioned
21. Why is said to be branch prediction is not applicable in DSP processor?
    a) low bandwidth
    b) low frequency
    c) high bandwidth
    d) high frequency
22. Which type of architecture in DSP processor reduces execution time?
    a) Von Neumann architecture
    b) Harvard architecture
    c) CISC architecture
    d) Program Storagel architecture
23. Which of the following Microprocessor act as a DSP processor?

a) 8086
b) 8088
c) 8080
d) ARM9E

24. What types of modules are used in the digital signal processor to form the loop structure

a) Modulo timer
b) Modulo counter
c) Timer
d) External Timer

25.Name the processor which is used in digital audio appliances

a) Motorola DSP56000
b) DSP 5600
c) 80486
d) AI 21XX

PART-B

1. What is the nyquist rate of the signal x(t)=3cos(50*pi*t)+10sin(300*pi*t)-cos(100*pi*t)?
    a) 50Hz
    b) 100Hz
    c) 200Hz
    d) 300Hz
2. Which bit coder is required to code a signal with 16 levels?
    a) 8 bit

b) 4 bit

c) 2 bit

d) 1 bit

3. **In TMS 320 C5X processor, which memory segment provides interfacing to external memory mapped peripherals and also serves as extra data storage space?**
   a. Program Memory
   b. Data memory
   c. I/O Memory
   d. All of the above

4. Which of the following is not possible when the signal is analog?
   a) Phase shifting
   b) Equalization
   c) Modulation
   d) Data compression

5. **Which kind of addressing mode for memory access operands support pre-index and post-index in addition to the generation of memory address by an immediate value added to a register?**

a. Register indirect addressing mode

b. Relative register indirect addressing mode
c. Base indexed indirect addressing mode
d. Base with scale register addressing mode

7. Memory management on a DSP processor must deal with all of found on

- Uniprocessor Computer
- Computer
- Processor
- System

7. In ………………… a set of related threads is scheduled to run on a set of processors at the same time, on a one to one basis.
A) Load Sharing
B) Gang Scheduling
C) Dynamic Scheduling
D) Load Scheduling

The norm or length of a signal is given by

a. The square of the energy of the signal
b. The square root of the energy of the signal

c. The inverse of the energy of the signal
d. The cube root of the energy of the signal

9. For the calculation of N- point DFT, Radix -2 FFT algorithm repeats

a. 2(N Log2 N) stages
b. $(N \text{ Log2 } N)^2/2$ stages
c. (N Log2 N)/2 stages
d. (N Log2(2 N))/2 stages

ANSWER: (c) (N Log2 N)/2 stages

10. Damping is the ability of a system

a. To support oscillatory nature of the system's transient response
b. To oppose the continuous nature of the system's transient response
c. To oppose the oscillatory nature of the system's transient response
d. To support the discrete nature of the system's transient response

ANSWER: (c) To oppose the oscillatory nature of the system's transient response

11. **Which is/are the correct way/s for the result quantization of an arithmetic operation?**

a. Result Truncation
b. Result Rounding
c. Both a and b
d. None of the above

ANSWER: (c) Both a and b

12. In ADSP 21 xx architecture, how many previously executed instructions are stored in instruction cache of cache memory?

a. 4
b. 8
c. 16
d. 32

ANSWER: (c)

13. Which bit coder is required to code a signal with 16 levels?
a) 8 bit
b) 4 bit

c) 2 bit
d) 1 bit

ANSWER: (b)

14. What is the nyquist rate of the signal x(t)=3cos(50*pi*t)+10sin(300*pi*t)-cos(100*pi*t)?
a) 50Hz
b) 100Hz
c) 200Hz
d) 300Hz

ANSWER: (d)

15. In the equation $x_q(n)=ax_q(n-1)+d_q(n)$, if $a < 1$ then integrator is called?
a) Leaky integrator
b) Ideal integrator
c) Ideal accumulator
d) Both Ideal integrator & accumulator

ANSWER: (A)