ii. What is aliasing and how it can be overcomed? 2 4 1 1

27. a. Compute the 8-point DFT of the sequence $x(n)=\{1,1,1,1,2,2,2,2\}$ using radix – 2 DIT FFT algorithm. 10 3 2 2

(OR)

b. Obtain the direct form II and cascade from realization for the system $y(n)=-0.1y(n-1)+0.2y(n-2)+3x(n)+3.6x(n-1)+0.6x(n-2)$. 10 4 2 2

28. a. Design a digital FIR filter which is having the frequency response 10 3 3 3

$$H\left(e^{j\omega}\right)=1 \quad for \frac{-\pi}{2}\le\frac{\pi}{2}$$
$$0 \quad otherwise$$

Find the values of h(n) for N=11 and also find H(z).

(OR)

b. Using Hamming window, design a digital FIR filter which is having the frequency response. 10 3 3 3

$$H\left(e^{j\omega}\right)=e^{-j5\omega} \quad for \frac{-\pi}{4}\le|\omega|\le\frac{\pi}{4}$$
$$0 \quad otherwise$$

Find the values of h(n) for N=7 and also find H(z).

29. a. Design a Butterworth digital IIR low pass filter using impulse invariant transformation to satisfy the following specification. $w_p=0.3\pi, w_s=0.75\pi, \in=1, \lambda=4.898$. 10 3 4 3

(OR)

b. Design a Chebyshev digital IIR low pass filter using Bilinear transformation to satisfy the following specification $w_p=0.2\pi, w_s=0.3\pi, \alpha_p=1dB, \alpha_s=15dB$. 10 3 4 3

30. a. Explain about the polyphase structure of decimeter and interpolator. 10 4 6 2

(OR)

b.i. Point out the advantages of multirate DSP. 2 4 5 2

ii. Explain about filter banks of multirate DSP. 8 4 6 2

* * * * *

Reg. No.															

B.Tech. DEGREE EXAMINATION, MAY 2022
Fifth Semester

18ECC204J – DIGITAL SIGNAL PROCESSING
(For the candidates admitted from the academic year 2018-2019 to 2019-2020)

Note:
(i) **Part - A** should be answered in OMR sheet within first 40 minutes and OMR sheet should be handed over to hall invigilator at the end of 40th minute.
(ii) **Part - B** should be answered in answer booklet.

Time: 2½ Hours Max. Marks: 75

PART – A (25 × 1 = 25 Marks)
Answer **ALL** Questions

Marks BL CO PO

1. Original signal can be retracted from sampled version using 1 1 1 1
(A) Band pass filtering (B) Band stop filtering
(C) Low pass filtering (D) High pass filtering

2. ________ should be done in order to convert a continuous – time signal to discrete time signal. 1 1 1 1
(A) Integrating (B) Differentiating
(C) Amplification (D) Sampling

3. The quantization will be finer when 1 1 1 1
(A) Smaller the number of discrete amplitudes (B) Larger the number of discrete amplitudes
(C) Does not depend on amplitudes (D) Depends on frequency

4. Identify the disadvantage of digital signal processing. 1 1 1 1
(A) Flexible in operation (B) Operation speed is limited
(C) Cost is low for large scale (D) Parallel execution

5. When a signal is sampled at the rate of $f_x = 5f_m$, the sampling done is called as? 1 2 1 1
(A) Over sampling (B) Down sampling
(C) Perfect sampling (D) Zero sampling

6. DFT is applied to 1 1 2 1
(A) Infinite sequences (B) Finite discrete sequence
(C) Continuous infinite signals (D) Continuous finite sequence

7. The circular convolution of two sequence in time domain is equivalent to 1 2 2 1
(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

8. DIT algorithm divides the sequence into 1 2 2 1
(A) Positive and negative values (B) Upper higher and lower spectrum
(C) Small and large samples (D) Even and odd samples

9. $y(n)$ is obtained by _________ of input $x(n)$ of the system with $h(n)$. 1 2 2 1
(A) Integration (B) Correlation
(C) Convolution (D) Differentiation

10. The total number of complex multiplications required to compute N point DFT by radix – 2 FFT is 1 1 2 4
(A) $(N/2)\log_2 N$ (B) $N\log_2 N$
(C) $(N/2)\log N$ (D) $N-1$

11. Identify which window function is also regarded as 'Raised – cosine window' when $\alpha = 0.5$? 1 2 3 1
(A) Hamming (B) Barlett
(C) Hanning (D) Blackman

12. The impulse response of a symmetrical FIR filter is 1 2 3 2
(A) $h(n) = h(N-1)/2$ (B) $h(n) = h(N-1-n)$
(C) $h(n) = h(-n)/2$ (D) $h(n) = h(n)/2$

13. To reduce side lobes, in which region of the filter the frequency specifications have to be optimized. 1 2 3 2
(A) Stop band (B) Pass band
(C) Transition band (D) Cut off

14. The FIR filter is a _______ filter. 1 1 3 1
(A) Unstable (B) Stable
(C) Non – causal (D) Recursive

15. Abrupt truncation of infinite series is done in ________. 1 2 3 2
(A) Windowing (B) Frequency sampling
(C) Aliasing (D) Fourier series

16. The locus of all the poles of Chebyshev filter form a ________. 1 1 4 1
(A) Circle (B) Parabola
(C) Ellipse (D) Hyperbola

17. In IIR filter design by the bilinear transformation, the bilinear transformation is a mapping from. 1 1 4 1
(A) Z-plane to S-plane (B) J-plane to W-plane
(C) W-plane to J-plane (D) S-plane to Z-plane

18. The impulse invariant method is obtained by 1 2 4 3
(A) Taking backward difference for the derivative (B) Sampling the impulse response of an equivalent analog filter
(C) Mapping from S-domain to Z-domain (D) Approximation of derivatives

19. __________ filter has pass-band ripple but a steeper roll-off rate. 1 2 4 3
(A) Chebysev – II (B) Elliptic
(C) Chebhysev – I (D) Bessel

20. The IIR filter design involves 1 2 4 3
(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

21. In direct form realization for an interpolator, which among the following generates an intermediate signal, 1 1 5 1
(A) Upsampler (B) Down sampler
(C) Anti-imaging filter (D) Anti-aliasing filter

22. Sampling rate conversion by the rational factor L/M is accomplished by what connection of interpolator and decimator. 1 2 6 2
(A) Parallel (B) Cascade
(C) Direct (D) Convolution

23. If $x(n) = \{1, 3, 2, 5, -1, -2, 2, 3, 2, 1\}$ apply 3 fold down sampler. 1 2 6 2
(A) $\{1, 2, -1, -2, 2\}$ (B) $\{1, 3, 2, 5, -1, -2, 2, 3, 2, 1\}$
(C) $\{1, 5, 2, 1\}$ (D) $\{1, 3, 5, -2, 3, 1\}$

24. Alias free and proper reconstruction is achieved by having __________ and ___________. 1 1 6 1
(A) Linear phase and all pass filter (B) Non linear phase and all pass filter
(C) Linear phase and low pass filtcr (D) Linear phase and high pass filter

25. Decimation is a process in which the sampling rate is 1 1 6 1
(A) Enhanced (B) Stable
(C) Reduced (D) Unpredictable

PART – B (5 × 10 = 50 Marks)
Answer **ALL** Questions

Marks BL CO PO

26. a.i. Explain how shifted samples are produced by taking fourier transform and state sampling theorem. 8 4 1 4

ii. Point out the applications of DSP. 2 4 1 1

(OR)

b.i. Explain the block diagram of DSP. 8 4 1 1