

GURU NANAK INSTITUTE OF TECHNOLOGY

An Autonomous Institute under MAKAUT

2020-2021

DIGITAL SIGNAL PROCESSING (Backlog)

EI504A

TIME ALLOTTED: 3 Hrs

FULL MARKS: 70

The figures in the margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable

GROUP – A

(Multiple Choice Type Questions)

Answer any *ten* from the following, choosing the correct alternative of each question: **10×1=10**

		Marks	CO No.
1.	i) In a causal system, the output depends on: a) Present input b) Past input c) Present and past inputs d) Future input	1	CO1
	ii) A signal has maximum frequency component of 30 kHz. The minimum sampling frequency for this signal is: a) 15 kHz b) 30 kHz c) 60 kHz d) 90 kHz	1	CO1
	iii) A 200 kHz signal is analysed by a 16-point DFT. The fundamental frequency is given by: a) 0 Hz b) 16 Hz c) 100 kHz d) 200 kHz	1	CO3
	iv) A recursive system is known as: a) System with memory b) System without memory c) System with time delay d) None of these	1	CO2
	v) Circular convolution is carried out to: a) Add two DFT results b) Subtract two DFT results c) Multiply two DFT results d) Divide one DFT result by another	1	CO3

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|-------|---|---|-----|
| vi) | Leakage is an error observed in: | | |
| | a) DTFT | | |
| | b) DFT | 1 | CO4 |
| | c) FIR | | |
| | d) IIR | | |
| vii) | The spectra of discrete-time signal is analysed by: | | |
| | a) FIR | | |
| | b) IIR | 1 | CO2 |
| | c) IDFT | | |
| | d) DFT | | |
| viii) | Downsampling is carried out in: | | |
| | a) Signal averaging | | |
| | b) Signal decimation | 1 | CO1 |
| | c) Sample rate conversion | | |
| | d) None of these | | |
| ix) | The number of inputs in a 5-tap FIR filter is: | | |
| | a) 5 | | |
| | b) 10 | 1 | CO4 |
| | c) 15 | | |
| | d) 20 | | |
| x) | The butterfly structure is observed in | | |
| | a) DTFT | | |
| | b) DFT | 1 | CO2 |
| | c) IDFT | | |
| | d) FFT | | |
| xi) | Cascading is used in IIR filter design to minimize: | | |
| | a) Quantization error | | |
| | b) Stability problem | 1 | CO3 |
| | c) Both a and b | | |
| | d) None of these | | |

GROUP – B

(Short Answer Type Questions)

(Answer any *three* of the following) **3 x 5 = 15**

- | | | Marks | CO No. |
|----|--|--------------|---------------|
| 2. | a) What is the difference between continuous-time signal and discrete-time signal? | 2 | CO1 |
| | b) How is signal discretization carried out? | 1 | CO1 |
| | c) How is a discrete-time signal represented by a sequence of numbers? | 2 | CO1 |
| 3. | a) What is energy of a discrete-time signal? | 2 | CO1 |
| | b) What is the difference between power signal and power of a signal? | 3 | CO1 |

B.TECH/AEIE /ODD/SEM-5/EI504A/R16/2020-2021

4.	a)	Two discrete-time LTI systems having unit impulse responses $H_1(n)$ and $H_2(n)$ respectively, are connected in series. Find the unit impulse response of the resultant system.	2	CO2
	b)	Represent a discrete-time LTI system in complex frequency domain.	3	CO2
5.		Define the following terms for a discrete-time system:		
	i)	Stable system		
	ii)	Causal system		
	iii)	Recursive system	5	CO1
	iv)	Dynamic system		
	v)	Time invariant system		
6.	a)	Why is filtering used in DSP?	2	CO4
	b)	What is difference between FIR and IIR?	3	CO4

GROUP – C

(Long Answer Type Questions)

(Answer any *three* of the following)

3 x 15 = 45

			Marks	CO No.
7.	a)	What are the applications of DSP techniques in areas of Instrumentation Engineering and Communication Engineering?	5	CO1
	b)	Prove that for a discrete-time LTI system, the output is a convolution of input and unit impulse response of the system.	5	CO1
	c)	Represent a discrete-time LTI system in complex frequency domain.	5	CO1
8.	a)	Why is DFT performed on a discrete-time signal?	2	CO3
	b)	What is inverse DFT?	2	CO3
	c)	What is shifting property of DFT?	3	CO3
	d)	What is circular convolution is DFT?	4	CO3
	e)	Derive the relation between DFT and DTFT.	4	CO3
9.	a)	Compare IIR filter and FIR filter.	5	CO4
	b)	Derive the z-domain transfer function of an M-th order IIR filter having N feedforward and M feedback stages.	5	CO4
	c)	What is downsampling?	2	CO4
	d)	Compare one-stage decimator and two-stage decimator.	3	CO4
10.		Answer any three from the following:	3X5=15	
	a)	Twiddle factor	5	CO 2
	b)	Digital filter banks	5	CO 4
	c)	Hamming window	5	CO 3
	d)	Radix 2 FFT algorithm	5	CO 3
	e)	Aliasing error	5	CO 1