GURU NANAK INSTITUTE OF TECHNOLOGY
An Autonomous Institute under MAKAUT
2022
ADVANCED DIGITAL SIGNAL PROCESSING
MCE201

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)	Digital Signal Processing is done for (a) Minimum Power Requirement (b) Minimum Cost (c) Minimum Noise (d) Above all	1	CO1
	(ii)	Low Pass Filter is used (a) to take signal having frequency within some bands. (b) to take signal having frequency higher than lower frequency. (c) to take signal having frequency from dc to a certain limit. (d) to take signal having frequency except some bands.	1	CO1
	(iii)	7.6 V is converted by Quantization to (a) 6 V (b) 7V (c) 8 V (d) 9 V	1	CO2
	(iv)	In Analog to Digital Converter, resolution is higher in (a) Flash Type (b) Dual Slope Type (c) Successive Approximation Type (d) Above all	1	CO2
	(v)	After normalizing to a set of samples, sample values lie between (a) $0 - 0.5$ (b) $0 - 1$ (c) $0 - 1.5$ (d) $0 - 2$	1	CO3
	(vi)	Causality condition depends on (a) present input. (b) past input. (c) present and past inputs. (d) present, past and future inputs	1	CO2

(vii)	In Discrete Fourier Transform, Discrete Time Signal is converted to (a) Amplitude (b) Real part of Frequency (c) Complex part of Frequency (d) Real plus Complex part of Frequency	1	CO3

(viii) Digital Filter is
(a) Moving Average Filter
(b) IIR Filter
(c) Median Filter
(d) Butterworth Filter
1 CO4

(ix) Butterworth Filter is mainly used as a
(a) High Pass Filter
(b) Low Pass Filter
(c) Band Stop Filter
(d) Band Pass Filter
1 CO3

(x) Aliasing means that
(a) the signal is not interfered by other signals
(b) the signal is partly interfered by other signals
(c) the signal is interfered by other signals
(d) Above all
1 CO3

(xi) Digital Signal Processing is applied in
(a) Speech Processing
(b) Image Processing
(c) VDU Processing
(d) Above all
1 CO4

(xii) Applying 3 dB cutoff frequency, output divided by input will be
(a) 0.4
(b) 0.5
(c) 0.75
(d) 1
1 CO3

GROUP – B
(Short Answer Type Questions)
Answer any *three* from the following: 3×5=15

			Marks	CO No
2.	(a)	What do you mean by digital signal processing?	2	CO1
	(b)	Explain the necessity of digital signal processing.	3	CO1
3.	(a)	The sample values to the right of an indicator (*) indicates the positive values of n, a discrete time signal with real valued samples is given by $\{x[n]\} = [\ldots, 1.2, -0.3, 3.15(*), 2.5, -2.93, 3.68, 0.8, 2.75,\ldots]$, find out the discrete time signal with necessary diagram.	4	CO2
	(b)	What do you mean by Venn diagram intersection of two sets of number?	1	CO2

4.	(a)	Write three Z-Transform properties.	3	CO3
	(b)	What is the difference between analog and discrete Fourier Transform?	2	CO3
5.	(a)	What is the difference between analog and digital filter?	3	CO4
	(b)	In communication system, where Low Pass Filter is used and why?	2	CO3
6.	(a)	How Digital Signal Processing use in Speech Processing?	3	CO4
	(b)	For removal of noise in speech, which type of filter is used?	2	CO4

GROUP – C
(Long Answer Type Questions)
Answer any *three* from the following: 3×15=45

			Marks	CO No
7.	(a)	Explain the generation of complex valued signals using Hilbert Transform.	5	CO1
	(b)	Consider two discrete time signals {g[n]} = [-15, 2.5, 4] and x[n] = [12, 3.6, -2.8, -4.6, 10]; compute {g[n] + x[n]} and {g[n].x[n]}.	6	CO2
	(c)	What is the difference between time representation of analog and digital (discrete) signals?	4	CO2
8.	(a)	How length of a discrete time signal is calculated?	4	CO2
	(b)	Describe unit step sequence of a discrete time signal with example.	6	CO2
	(c)	Compute the energy of x[n], which is a discrete time signal with finite sample values.	5	CO2
9.	(a)	Consider the set of numbers {2, -3, 10, 5, -1}, Calculate its median filter.	7	CO3
	(b)	What do you mean by a linear time-invariant (LTI) discrete time system and elaborate with examples?	5	CO3
	(c)	What is the difference between Z-Transform and Fourier Transform?	3	CO3
10.	(a)	Write and Explain the discrete-time Fourier transform $X(e^{jw})$ of a sequence x[n] with examples.	5	CO3
	(b)	Describe in brief Successive Approximation type analog to digital (A to D) converter.	7	CO3
	(c)	Why Sample and Hold Operation is done in analog to digital converter?	3	CO3
11.	(a)	Explain the magnitude squared response of an analog low pass Butterworth filter $H_a(s)$ of Nth order.	5	CO3
	(b)	Describe in brief the specifications of a digital filter design.	5	CO3
	(c)	Explain bilinear transformation method of IIR Filter design.	5	CO3