

Seat No.

Enrolment No.

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER-VII (NEW) EXAMINATION – SUMMER 2024

Subject Code: 3171708

Date:24-05-2024

Subject Name: Digital Signal Processing (IC)

Time:02:30 PM TO 05:00 PM

Total Marks:70

Instructions:

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.
4. Simple and non-programmable scientific calculators are allowed

		MARKS
Q.1	(a) Draw block diagram of Digital Signal Processing & compare Digital signal processing over Analog signal Processing.	03
	(b) Write a short note on frequency domain sampling and reconstruction of discrete – time signals.	04
	(c) Consider the analog signal $X_a(t)=3 \cos 100\pi t$ (a) Determine the minimum sampling rate required to avoid aliasing. (b) Suppose that the signal is sampled at the rate $F_s = 200$ Hz What is the discrete-time signal obtained after sampling?	07
Q.2	(a) Enlist difference between FIR and IIR Filter	03
	(b) Compute the DFT of the following: (1) $x(n) = \delta(n)$	04
	(c) Explain Direct form - I structure of IIR system in brief.	07
OR		
	(c) Explain Direct form - II structure of IIR system in brief.	07
Q.3	(a) Give classification of signals in detail.	03
	(b) State & Prove linearity property of DFT.	04
	(c) For a given discrete time systems, (a) $y(n) = x(2n)$ (b) $y(n) = \sin [x(n)]$ Check whether they are: (1) Static or dynamic (2) Linear or non-linear	07
OR		
Q.3	(a) Explain with suitable example recursive and non-recursive system.	03
	(b) Explain symmetry properties of DFT.	04
	(c) For a given discrete time systems, (a) $y(n) = x(-n)$ (b) $y(n) = x(n) + x(n - 2)$ Check whether they are: (1) Causal or non-causal (2) Stable or unstable	07
Q.4	(a) Explain with example following operations on signal. 1)Time Shifting 2) Time Reversal	03
	(b) Perform circular convolution of $x(n)=\{2,1,2,1\}$ and $y(n)=\{1,2,3,4\}$	04
	(c) Compute 4 point DFT of sequence $x(n)=\{1,2,3,4\}$.	07

OR

- Q.4** (a) Explain with example following operations on signal. 1) Amplitude Scaling 2) Time Scaling **03**
- (b) Obtain the linear convolution of $x(n) = \{1, 2, 2, 1\}$ $h(n) = \{1, 2, 1\}$ **04**
- (c) Determine IDFT of $x(k) = \{2, 1+j, 0, 1-j\}$. **07**
- Q.5** (a) Write advantages of the FFT algorithm. **03**
- (b) Explain bilinear transformation method for FIR filter design. **04**
- (c) Find FFT of $x(n) = \{1, 2, 3, 4\}$ using DIT FFT Algorithm. **07**

OR

- Q.5** (a) Explain the term radix in FFT. **03**
- (b) Explain Impulse Invariance Method for IIR filter design. **04**
- (c) Find FFT of $x(n) = \{1, 2, 3, 4\}$ using DIF FFT Algorithm. **07**
