

GUJARAT TECHNOLOGICAL UNIVERSITY**BE- SEMESTER- VII EXAMINATION – SUMMER 2026****Subject Code:3171708****Date:01-06-2026****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) Compare merits and demerits of DSP over ASP.	03
	(b) 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?	04
	(c) Explain Sampling theorem in detail?	07
Q.2	(a) Obtain the linear convolution of $x(n) = \{1, 2, 0, 1\}$ & $h(n) = \{0, 1, 0, 1\}$	03
	(b) Perform the circular convolution of the two sequences $x_1(n) = \{2, 1, 2, 1\}$ and $x_2(n) = \{1, 2, 3, 4\}$	04
	(c) Determine the impulse response $h(n)$ for the system described by the second-order difference equation $y(n) - 3y(n-1) - 4y(n-2) = x(n) + 2x(n-1)$	07
OR		
Q.3	(c) Explain about impulse invariance method for IIR filter design.	07
	(a) Discuss the application of DSP in industries.	03
	(b) Explain with suitable example recursive and non-recursive system.	04
Q.3	(c) Determine the direct form I and form II realization for following system $Y(n) = x(n) - x(n-1) + 2x(n-2) - 3y(n-1) + 4y(n-2)$	07
	OR	
	(a) Explain Notch filters with respective waveform.	03
Q.3	(b) Compute 4-point DFT of the given sequence $x[n] = \{1, 0, 1, 0\}$	04
	(c) Explain about various signal processing methods and its applications for digital signal.	07
Q.4	(a) Derive the lattice structures of FIR filters.	03
	(b) Prove the linearity and time shifting properties of Fourier Transform.	04
	(c) List out and prove properties of DFT.	07
OR		
Q.4	(a) Prove the periodicity of DFT.	03
	(b) Explain bilinear transformation method for FIR filter design.	04
	(c) Derive the frequency sampling structures of FIR filters.	07
Q.5	(a) What are even and odd signals? Give example.	03
	(b) Perform the circular convolution of two sequence $X_1(n) = \{1, 3, 5, 3\}$ and $X_2(n) = \{2, 3, 1, 1\}$	04
	(c) Explain Radix-2 Decimation in Time algorithm.	07

OR

- Q.5**
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|-----|---|-----------|
| (a) | Derive the frequency sampling structures of IIR filters. | 03 |
| (b) | Determine auto-correlation of the following signal: $x(n) = \{1, 2, 1, 1\}$ | 04 |
| (c) | Explain the selection of DSP processor for signal processing applications. | 07 |
