

Seat No.: _____

Enrolment No. _____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE – SEMESTER- VII EXAMINATION-SUMMER 2023

Subject Code: 171003

Date: 30/06/2023

Subject Name: Digital Signal Processing

Time: 10:30 AM TO 01:00 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.

- Q.1** (a) State and prove any two properties of z-transform. **07**
(b) Explain Signal classification with examples. **07**

- Q.2** (a) List the advantages and disadvantages of Digital signal processing over Analog signal processing. **07**
(b) Draw Direct form-I and Direct form-II structures for the system whose system function is, **07**

$$H(z) = \frac{(1 - 2z^{-1})(1 - 4z^{-1})}{z\left(1 - \frac{1}{2}z^{-1}\right)}$$

OR

- (b) Determine Z transform of the signal: **07**
 $x[n] = \delta(n+1) + 3\delta(n) + 6\delta(n-3) - \delta(n-4)$
- Q.3** (a) What is ROC in context of Z-transform? List various properties of ROC. **07**
(b) Perform the linear convolution of the following sequences : **07**
 $x_1(n) = \{1, 2, 3, 4, 5\}$, $x_2(n) = \{-1, 0, 1\}$

OR

- Q.3** (a) Determine impulse response of LTI systems described by the following second order difference equation. **07**
 $y(n) - 3y(n-1) - 4y(n-2) = x(n) + 2x(n-1)$
(b) What is Circular Convolution? How is it different from Linear Convolution? **07**
Determine the circular convolution of two sequences,
 $x(n) = \cos(\pi n/2)$ for $n=0, 1, 2, 3$
 $h(n) = 2^n$ for $n=0, 1, 2$

- Q.4** (a) Explain the concept of analog to digital conversion with a neat diagram. **07**
(b) Check the following systems for time invariance and linearity. **07**
i) $y(n) = n[x(n)]^2$
ii) $y(n) = x(n)\cos(n\pi/4)$

OR

- Q.4** (a) Describe IIR filter design by Impulse Invariant method. **07**
(b) Determine Partial Fraction Expansion of **07**

$$X(z) = \frac{(1 + z^{-1})}{(1 - z^{-1} + 0.5z^{-2})}$$

- Q.5** (a) Discuss the key features of the architecture of DSP Processors. **07**
(b) Explain Radix-2 Decimation In Time (DIT) FFT Algorithm. **07**

OR

- Q.5** (a) Explain Multiplier-Accumulator (MAC) hardware in DSP processors. **07**
(b) Derive the criterion for sampling a continuous time signal, using Fourier **07**
Transform. Also explain the aliasing effect where the criterion is not followed.
