

**GUJARAT TECHNOLOGICAL UNIVERSITY****BE - SEMESTER-VII (OLD) EXAMINATION – WINTER 2023****Subject Code:171003****Date:12-12-2023****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.

	MARKS
<b>Q.1</b> (a) Define: (1) Continuous time signal (2) Discrete time signal (3) Impulse signal	<b>03</b>
(b) Determine even and odd component of $x(t) = e^{jt}$	<b>04</b>
(c) Discuss advantage & disadvantage of D.S.P. over A.S.P.	<b>07</b>
<b>Q.2</b> (a) Define: (1) Fourier Series (2) Laplace Transform (3) Inverse Laplace Transform	<b>03</b>
(b) Discuss Dirchlet's conditions	<b>04</b>
(c) Explain classification of discrete time signals with examples.	<b>07</b>
<b>OR</b>	
(c) Explain classification of discrete time systems with examples.	<b>07</b>
<b>Q.3</b> (a) Define: (1) Z- Transform (2) D.F.T. (2) D.T.F.T.	<b>03</b>
(b) List properties of convolution.	<b>04</b>
(c) A system has an impulse response $h[n] = \{1,2,3\}$ and output response $y[n] = \{1,1,2, -1,3\}$ . Determine the input sequence $x[n]$ .	<b>07</b>
<b>OR</b>	
<b>Q.3</b> (a) Give Difference and Similarity between Linear and Circular Convolution with example.	<b>03</b>
(b) List important properties of the ROC for the Z Transform.	<b>04</b>
(c) Determine the causal signal $x[n]$ having the z-transform $X(Z) = 1 / (1 + z^{-1})(1 - z^{-1})^2$	<b>07</b>
<b>Q.4</b> (a) Define: (1) Correlation (2) Initial Value Theorem (3) Final Value Theorem	<b>03</b>
(b) Discuss relationship between the DFT and other Transforms.	<b>04</b>
(c) Determine the IDFT of $X(k) = \{3, (2+j), 1, (2-j)\}$	<b>07</b>
<b>OR</b>	
<b>Q.4</b> (a) Discuss (1) Direct Form – I Realization (2) Direct Form – II Realization with suitable example	<b>03</b>
(b) List difference between IIR and FIR filters.	<b>04</b>
(c) Obtain a cascade realization of the system characterized by the transfer function $H(Z) = 2(z + 2) / [z(z - 0.1)(z + 0.5)(z + 0.4)]$	<b>07</b>
<b>Q.5</b> (a) Discuss Kaiser window in details.	<b>03</b>
(b) Discuss IIR Filter design by impulse invariant method.	<b>04</b>
(c) Explain radix-2 DIT FFT algorithm with suitable example.	<b>07</b>
<b>OR</b>	

- Q.5** (a) Define: (1) Rectangular window function (2) Hamming window function (3) Hanning Window function **03**
- (b) Discuss IIR Filter design by bilinear transformation method. **04**
- (c) Explain radix-2 DIF FFT algorithm with suitable example. **07**