

GUJARAT TECHNOLOGICAL UNIVERSITY**BE - SEMESTER-VI (NEW) EXAMINATION – WINTER 2023****Subject Code:3162414****Date:18-12-2023****Subject Name: Digital signal Processing for Power Electronics****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.

- Q.1** (a) Prove that $\delta(n) = u(n) - u(n-1)$. Plot the resultant signal. **03**
(b) An LTI system has impulse response $h(n) = 5(-1/2)^n u(n)$. Using Fourier transform, find the output of this system when the input is $x(n) = (1/3)^n u(n)$. **04**
(c) State and explain sampling theorem. **07**
- Q.2** (a) State relation between Laplace Transform and Z-transform. **03**
(b) Explain one-sided Z-transform. **04**
(c) Given an input sequence $x(n) = \{1, 2, 3\}$ is passed through a filter given by $h(n) = \{1, 2\}$. Find the output $y(n)$ using a convolution method. **07**
- OR**
- (c) Given an input sequence $x(n) = \{1, 2, 3\}$ is passed through a filter given by $h(n) = \{1, 2\}$. Find the output $y(n)$ using Z-transform. **07**
- Q.3** (a) What are the basic elements used to construct block diagram of a discrete time system? **03**
(b) Enlist difference between continuous time and discrete time Fourier Series. **04**
(c) An LTI system is described by $y(n) - 0.5y(n-1) - 0.25y(n-2) = x(n)$. Determine the cascaded realization structure of the system. **07**
- OR**
- Q.3** (a) What are the basic elements used to construct signal flow graph of a discrete time system? **03**
(b) If $x(n) = 2\sin(\sqrt{3}/2)\pi n$, determine the Fourier Series representation of the discrete time signal $x(n)$. **04**
(c) (i) Compare FIR filter with IIR filter in tabular form. **07**
(ii) Explain in brief the linear phase FIR filters?
- Q.4** (a) Test the signal $y(n) = 2nx(n)$ for the time-invariance. **03**
(b) Discuss the quantization effect & errors there in. **04**
(c) An LTI system is characterized by $y(n) - ay(n-1) = x(n)$; determine its frequency and impulse response. **07**
- OR**
- Q.4** (a) Test the signal $y(n) = n x(n)$ for causality. **03**
(b) List various peripherals available in a DSP IC chips. **04**
(c) Why linear convolution is important in digital signal processing? State difference between Linear & Circular convolution. **07**
- Q.5** (a) What are the different formats of fixed point representation? **03**
(b) What is the difference between von Neumann and Harvard architecture? **04**

(c) Discuss the frequency spectrum using DFT. **07**

OR

Q.5 (a) Discuss the concept of zero input limit cycle oscillation. **03**

(b) How pipelining improve the computational speed? **04**

(c) Find the 4- point DFT of the sequence $x(n) = \{1, 1, -2, -2\}$. **07**

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