

GUJARAT TECHNOLOGICAL UNIVERSITY**BE- SEMESTER– VI EXAMINATION – SUMMER 2026****Subject Code:3162414****Date:05-06-2026****Subject Name: Digital signal Processing for Power Electronics****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
Q.1	(a) Sketch $x(t) = 2 * u(t + 3) - 2 * u(t - 3)$ signal.	03
	(b) Define the following elementary signals in discrete domain with necessary diagrams. (a) Unit step function. (b) Unit ramp function. (c) Unit parabolic function. (d) Unit impulse function.	04
	(c) Explain sampling theorem with necessary diagrams.	07
Q.2	(a) Determine the system $y[n] = x[n] + n x[n + 1]$ is time variant or time invariant.	03
	(b) Define energy and power signals.	04
	(c) State and prove linearity property of Z transform.	07
	OR	
	(c) List and discuss various properties of discrete time Fourier transform.	07
Q.3	(a) Determine the system $y[n] = x[2n]$ is liner or not. Derive the relation between Z transform and Fourier transform.	03
	(b) Find out convolution sum of $x(n) = \{1,0,-1\}$ and $h(n) = \{-2,1\}$ with graphical method.	04
	(c) Define even and odd signals. Evaluate the even and odd parts of any signal as an example.	07
	OR	
Q.3	(a) What is aliasing effect? Describe its effect for signal reconstruction.	03
	(b) Compare Fixed Point and Floating Point number representation.	04
	(c) Convolve following two sequences. $X[n] = \begin{cases} n + 1 & \text{for } 0 \leq n \leq 2 \\ 0 & \text{otherwise} \end{cases}$ $H[n] = a^n u[n] \text{ for all } n. (a < 1)$	07

- Q.4** (a) Find the DTFT of $x(n) = \{1, -2, 2, 3\}$ **03**
 (b) Find the DTFT of rectangular pulse sequence $x(n) =$ **04**
 $A, |n| \leq N$
 $0, |n| > 1$
 (c) Prove that for causal sequences, the ROC is the exterior of a circle of radius r . **07**
- OR**
- Q.4** (a) Find IDFT of $X(\omega) = 2 + e^{-j\omega} + 3e^{-j3\omega} + 4e^{-j4\omega}$ **03**
 (b) Find the Z transform and ROC of $x[n] = \alpha^n u(n)$. **04**
 (c) Discuss and compare Block Diagram & Signal Flow graph representation of discrete time systems with suitable example. **07**
- Q.5** (a) Compare FIR & IIR system realization. **03**
 (b) Describe the concept of pipelining in DSP processors along with its basic operational phases. **04**
 (c) Give comparison of Harvard and Von-Neumann architecture. **07**
- OR**
- Q.5** (a) State various applications of DSP processors with respect to power electronics converters. **03**
 (b) Realize the system with transfer function $H(s) = \frac{s+5}{s^2+2s+4}$ in direct form-I structure. **04**
 (c) Describe various components on DSP IC chips required for power electronics applications **07**
