

Enrolment No./Seat No _____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER-VI EXAMINATION – SUMMER 2025

Subject Code:3162414

Date:04-06-2025

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.

Q.1 (a) Draw $x(t) = r(-t) * u(t + 2)$ signal. **03**

Define the following elementary signals in time domain as well as in

(b) discrete domain with necessary diagrams. **04**

(a) Unit step function. (b) Unit ramp function.

(c) Explain sampling theorem in detail. **07**

Q.2 (a) Compare Fixed-Point and Floating-Point number representation. **03**

(b) Define energy and power signals. Give one example of each. **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) Describe various components on DSP IC chips required for power electronics applications **03**

(b) Derive the relation between Z transform and Fourier transform. **04**

(c) Define even and odd signals. Evaluate the even and odd parts of any signal as an example. **07**

OR

Q.3 (a) Give difference between linear and circular convolution. **03**

(b) Evaluate the system $y(n) = n^2 * x(n)$ for linearity and time variance. **04**

(c) Find out convolution of $x(n) = \{1, 2, 0, -1\}$ and $h(n) = \{-2, 1, 1\}$ using graphical method. **07**

Q.4 (a) Find the DTFT of $x(n) = \{1, -2, 2, 3\}$. **03**

(b) Find the DTFT of rectangular pulse sequence $x(n) = \begin{cases} A, & |n| \leq N \\ 0, & |n| > N \end{cases}$ **04**

(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 of $n^2 * u(n)$. **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 processor 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 w.r.t. 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**
