

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER-VI (NEW) EXAMINATION – SUMMER 2023

Subject Code:3162414

Date:20-07-2023

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 the signal represented by $x(t) = \delta \sin(t)$. **03**
 (b) Define periodicity. Check whether the following signal is periodic or not. If the signal is periodic, then specify its fundamental period. **04**

$$x(t) = je^{j10t}$$

 (c) Define 1) Signal 2) System. Classify them. **07**

$$x(t) = je^{j10t}$$

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|------------|--|-----------|
| Q.2 | (a) State the need of Z transform in Power Electronics with reference to DSP. | 03 |
| | (b) Describe the concept of Limit Cycle Oscillations & importance of Scaling | 04 |
| | (c) Explain the concept and advantages of pipelining in DSP. | 07 |

OR

- (c)** Find out correlation of the following sequences **07**

$$x(n) = \{2, 1, 3, 7, \mathbf{1}, 2, -3\} \text{ and } y(n) = \{1, -1, 2, -2, \mathbf{4}, 1, -2, 5\}$$

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| Q.3 | (a) Describe round-off effect in digital filters. | 03 |
| | (b) State the full form of ROC and its importance. | 04 |
| | (c) Explain sampling process and reconstruction of signal with an example. | 07 |

OR

- Q.3**
- | | | |
|------------|--|-----------|
| (a) | Sketch $x(n - 2)$ for a discrete-time signal $X(n) = \{2, 5, 4, -3, -1, -5, 2\}$ | 03 |
| | $\uparrow$ | |
| (b) | State the properties of Discrete Fourier Transform (DFT). | 05 |
| (c) | Determine the z-transform of | 06 |
| | 1) A unit impulse function $x(n) = \delta(n)$ | |
| | 2) A unit step function $x(n) = u(n)$ and 3) $x(n) = u(-n)$. | |

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- Q.4**
- (a)** For $N=L$ find the N point DFT of finite duration sequence of length L given as **03**
 $x(n) = 1$ for $0 \leq n \leq L - 1$,
 $x(n) = 0$ otherwise.
- (b)** Define power and energy signal. Give one example of each. **04**
- (c)** Define the following terms: **07**
1) State space 2) Correlation 3) ROC 4) Sampling 5) Aliasing 6) Impulse Response 7) Convolution

OR

- Q.4** (a) Find the IDFT of $Y(K) = \{1, 0, 1, 0\}$. **03**
 (b) Describe Direct Memory Access in DSP with its advantages. **04**

- (c) Explain the structures for realization of IIR systems in brief. 07
- Q.5** (a) Compare FIR and IIR systems (Any 3 points). 03
- (b) Find the mantissa and exponent required respectively to represent '5' in binary floating-point representation. 04
- (c) State applications of DSP in power electronics. Explain any one. 07
- OR**
- Q.5** (a) Compare DFT and DTFT (Any 3 points). 03
- (b) Explain Radix-2 DIT algorithm. 04
- (c) Explain Modified Harvard Architecture. 07
