Seat No.: _____ **Enrolment No._____**

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–V (NEW) - EXAMINATION – SUMMER 2017

Subject Code: 2150307 **Date:05/05/2017**

Subject Name: DIGITAL SIGNAL PROCESSING

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.**

MARKS

Q.1 **Short Questions** **14**

1 The system $y(t) = x(t) + 2x(t + 3)$ is

A causal system **B** non-causal system

C partly (a) and partly (b) **D** none of these

2 The system characterized by the equation a x (t) +b =y (t) is

A non-linear **B** linear if b < 0

C linear if b > 0 **D** linear for any value of b

3 The auto-correlation function of a rectangular pulse of duration T is

A a triangular pulse of duration 2T **B** a rectangular pulse of duration 2T

C a triangular pulse of duration T **D** a rectangular pulse of duration T

4 Two sequences x1 (n) and x2 (n) are related by x2 (n) = x1 (- n). In the z-domain, their ROC's are

A reciprocal of each other B negative of each other

C same. D complements of each other

5 The continuous time system described by y (t)= x (t^2) is

A causal, non-linear and time varying B non causal, non-linear and time-invariant

C causal, linear and time varying. D non causal, linear and time-invariant

6 Given a unit step function u(t), its time-derivative is:

A A unit impulse B Another step function

C A unit ramp function D A sine function

7 z-transform converts convolution of time-signals to

A Addition B Subtraction

C Multiplication D Division

8 Region of convergence of a causal LTI system

A Does not exist B Is the entire s-plane

C Is the left-half of s-plane D Is the right-half of s-plane

9 The DFT of a signal x(n) of length N is X(k). When X(k) is given and x(n) is computed from it, the length of x(n)

A Is increased to infinity B Remains N

C Becomes 2N–1 D Becomes N^2

10 u[n] be a unit step sequence. The sequence u[N-n] can be described as

A $x[n]=\begin{cases}1, & n\le N\\ 0, & \text{otherwise}\end{cases}$

B $x[n]=\begin{cases}1, & n> N\\ 0, & \text{otherwise}\end{cases}$

C $x[n]=\begin{cases}1, & n\ge N\\ 0, & \text{otherwise}\end{cases}$

D $x[n]=\begin{cases}1, & n< N\\ 0, & \text{otherwise}\end{cases}$

11 The Fourier transform of a signal x(t)= e^{2t} u(-t) is given by

A $\dfrac{1}{2-j\omega}$

B $\dfrac{1}{j2-\omega}$

C $\dfrac{2}{1-j\omega}$

D $\dfrac{2}{j2-\omega}$

12 The region of convergence of a causal finite duration discrete-time signal is

A the entire z-plane

B the entire z-plane except z=0

C the entire z-plane except z=∞

D a strip in z-plane enclosing jω-axis

13 For a stable system

A |Z|>1

B |Z|=1

C |Z|<1

D |Z|≠ 1

14 The z transform of –u(-n-1) is

A $\dfrac{1}{1-z}$

B $\dfrac{z}{1-z}$

C $\dfrac{1}{1-z^{-1}}$

D $\dfrac{z}{1-z^{-1}}$

Q.2 **(a)** Distinguish between deterministic and random signals. **03**

(b) Explain Classification of Systems. **04**

(c) Write a short note on concept of sampling and aliasing in sampled system. **07**

OR

(c) Draw the basic block diagram of a digital signal processing system. Also list application of the digital signal processing. **07**

Q.3 **(a)** What do you mean by correlation? Explain with examples. **03**

(b) Explain the following types of discrete time systems: (i)linear (ii)time invariant **04**

(c) Write a short note on Goertzel algorithm. **07**

OR

Q.3 **(a)** Define Z-transform. **03**

(b) Enlist the property of Region of Convergence for ztransformwith necessary illustration. **04**

(c) Realize the IIR system described by H(z) in direct form I and direct form II **07**

$$H(z)=\frac{1+2z^{-1}+z^{-2}}{1-0.75z^{-1}+0.125z^{-2}}$$

Q.4 **(a)** Obtain the inverse z-transform of the following: **03**

$X(z)=\log(1+a\,z^{-1})$, $|z|>|a|$

(b) Explain Mapping between S-plane and Z-plane. **04**

	(c)	Define FFT. Find 4 point DFT of the sequence x(n) { 2,1,4,3} by DIF FFTalgorithm also plot the magnitude and phase plot.	**07**
		OR	
Q.4	**(a)**	Compare Butterworth and Chebyshev filters.	**03**
	(b)	What is windowing in FIR filter?Give suitable examplesof windowing.	**04**
	(c)	Write a short note on Adaptive filters.	**07**
Q.5	**(a)**	What are the different parts of an ECG wave?	**03**
	(b)	What is Equiripple Approximation?	**04**
	(c)	Explain IIR filter design by bilinear transformation method.	**07**
		OR	
Q.5	**(a)**	How to remove Motion artifacts from ECG signal?	**03**
	(b)	Explain detection of Alpha, Beta and Gamma wave.	**04**
	(c)	Explain Arrhythmia detection algorithms in detail.	**07**

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