

C.U.SHAH UNIVERSITY

Winter Examination-2015

Subject Name: Signals and Systems

Subject Code : 4TE05SAS1

Branch : B.Tech(IC)

Semester : 5 Date : 2/12/2015 Time : 2:30 To 5:30

Marks : 70

Instructions:

- (1) Use of Programmable calculator & any other electronic instrument is prohibited.
 - (2) Instructions written on main answer book are strictly to be obeyed.
 - (3) Draw neat diagrams and figures (if necessary) at right places.
 - (4) Assume suitable data if needed.
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Q-1 Answer following questions:

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1. _____ Data have discrete states and take discrete values.
 - A. Analog
 - B. Digital
 - C. A and B both
 - D. None of the above
2. Frequency and period are _____.
 - A. inverse of each other
 - B. proportional to each other
 - C. the same
 - D. none of the above
3. _____ is the rate of change with respect to time.
 - A. Amplitude
 - B. Time
 - C. Frequency
 - D. Voltage
4. A sine wave in the _____ domain can be represented by one single spike in the _____ domain.
 - A. time; frequency
 - B. frequency; time
 - C. time; phase
 - D. phase; time
5. The _____ of a composite signal is the difference between the highest and the lowest frequencies contained in that signal.
 - A. frequency
 - B. period
 - C. bandwidth
 - D. amplitude
6. A system which is linear is said to obey the rules of
 - A. Scaling
 - B. Additivity
 - C. both scaling and additivity



- D. none of the above
7. A time invariant system is a system whose output
- Increases with a delay in input
 - Decreases with a delay in input
 - Remains same with a delay in input
 - Vanishes with a delay in input
8. A system is said to be defined as non causal, when
- The output at the present depends on the input at an earlier time
 - The output at the present does not depend on the factor of time at all
 - The output at the present depends on the input at the current time
 - the output at the present depends on the input at a time instant in the future
9. All causal systems must have the component of
- Memory
 - Time invariance
 - Stability
 - Linearity
10. The period of the function $\cos \pi(t-1) / 4$ is
- 1/8 seconds
 - 8 seconds
 - 4 seconds
 - 1/4 seconds
11. The analog signal $x(t)$ is given below $x(t) = 4 \cos 100 \pi t + 8 \sin 200 \pi t + \cos 300 \pi t$, the Nyquist sampling rate will be
- 1/100
 - 1/200
 - 1/300
 - 1/600
12. The region of convergence of z-transform of $x(n) = a^n u(n)$ is
- $z > a$
 - $z < a$
 - $|z| > a$
 - $|z| < a$
13. A function having frequency f is to be sampled. The sampling time T should be,
- $T = 1/2 f$
 - $T > 1/2 f$
 - $T < 1/2 f$
 - $T \geq 1/2 f$
14. The Fourier series of an odd periodic function contains
- Odd harmonics only
 - Even harmonics only
 - Cosine harmonics only
 - Sine harmonics only



Attempt any four questions from Q-2 to Q-8

- Q-2** a) Explain the classifications of signals. **07**
 b) If $x(n) = \{1, 3, -2, 0, 2, -2, 1, 3\}$, find out following: **07**
 ↑
 i. $x(n-2)$ iv. $x(n+3)$ vi. $x(2n)$
 ii. $x(-n-2)$ v. $x(-n+3)$ vii. $x(n/2)$
 iii. $x(-n)$
- Q-3** a) If $y(n) = x(n) * h(n)$, then find out $y(n)$ for $x(n) = \{1, 2, 3\}$ and $h(n) = \{1, 2, -2, -1\}$ **07**
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 b) Obtain the Fourier components of the periodic rectangular function $f(t)$, **07**
 Where, $f(t) = 0$ for $-T/2 < t < -T/4$
 $= A$ for $-T/4 < t < T/4$
 $= 0$ for $T/4 < t < T/2$
- Q-4** a) Explain Parseval's theorem for Fourier series and Fourier transform. **07**
 b) Determine the Fourier transform of the rectangular pulse expressed by, **07**
 $f(t) = 1$, for $0 < t < T$
 $= 0$, otherwise.
- Q-5** a) Enlist and state in brief the properties of Laplace transform. **07**
 b) Find out the Laplace transform of following functions: **07**
 i. Unit step function
 ii. Exponential function
 iii. Sine function
 iv. Cosine function
- Q-6** a) What is z-transform? Define ROC of z-transform and enlist important properties of ROC for z-transform. **07**
 b) What is time scaling property of z-transform? Derive the z-transform of following signals using time scaling property. **07**
 i. $x(n) = a^n \cos \omega_0 n$ ii. $x(n) = a^n \sin \omega_0 n$
- Q-7** a) Find out the inverse z-transform of following using partial fraction method: **07**
 $sX(z) = \frac{z}{3z^2 - 4z + 1}$
 If the ROC are, a) $|z| > 1$, b) $|z| < 1/3$
 b) Find the $x(n)$ for $X(z) = \frac{z}{(z-1)^3}$ **07**



- Q-8** a) Explain the sampling theorem. What is a Nyquist criterion? How the aliasing error generated during reconstruction of signal can be eliminated? **07**
- b) Draw and explain the block diagram of A to D conversion in detail. **07**

