Enroll. No._____

MARWADI UNIVERSITY

Faculty of Technology

Department of Information & Communication Technology

B.Tech **SEM: III** **WINTER:2018**

Subject: - Signals & Systems (01CT0302) **Date:- 26/10/2018**

Total Marks:-100 **Time: - 03:00 hours**

Instructions:

1. **All Questions are Compulsory.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

Question: 1. (a) **Answer the following:** [10]

(1) Discrete time signal is derived from continuous time signal by _____ process.
a) Addition b) Multiplying
c) Sampling d) Addition and multiplication

(2) Odd signals are symmetric about the vertical axis.
a) True b) False

(3) When x(t) is said to be non periodic signal?
a) If the equation x (t) = x (t + T) is satisfied for all values of T
b) If the equation x (t) = x (t + T) is satisfied for only one value of T
c) If the equation x (t) = x (t + T) is satisfied for no values of T
d) If the equation x (t) = x (t + T) is satisfied for only odd values of T

(4) Graphical representation of signal in frequency domain is called
a) Frequency Spectrum b) Frequency
c) Wave form d) None of the above

(5) Y (t) = x (t/3) is _____
a) Compressed signal b) Expanded signal
c) Time shifted signal d) Amplitude scaled signal by factor 1/3

(6) What is the associative property of discrete time convolution?
a) $[x_1(n) * x_2(n)]*h(n) = x_1(n)* [x_2(n)*h(n)]$
b) $[x_1(n) * x_2(n)]+h(n) = x_1(n) + [x_2(n)*h(n)]$
c) $[x_1(n) + x_2(n)]*h(n) = x_1(n)* [x_2(n)+h(n)]$
d) $[x_1(n) * x_2(n)]h(n) = x_1(n) [x_2(n)*h(n)]$

(7) $t\,\delta(t)=$ _____
a) t b) 0
c)1 d) u(t)

(8) Which of the following is an example of amplitude scaling?
a) Electronic amplifier b) Electronic attenuator
c) Both amplifier and attenuator d) Adder

(9) A signal is power signal if
a) E=0, P=0 b) E= infinite , P=Finite
c) E= finite ,P=0 d) E = finite , P=infinite

(10) A deterministic signal has
a) No uncertainty b) Uncertainty
c) Partial uncertainty d) None of the above

(b) Attempt the following: (Two marks each) [10]

(1) Examine whether the following signals are periodic or not?
a) Sin 13πt b) 2+ cos2πt

(2) Find even and odd component of following signal
x(n)= {-2,5,1,3}

(3) Define : (i)Impulse response (ii) Convolution.

(4) Describe Commutative and Distributive property for Discrete time LTI system.

(5) Check the following signal is energy signal or power signal.
(i) $x(t)= e^{-at} u(t)$, $a<0$
(ii) $x(n)= (-0.5)^n u(n)$

Question: 2.

(a) Describe classification of systems in detail with example. [08]

(b) Sketch the following signals:
(i) 2u(t+2)-2u(t-3) [02]
(ii) -2r(t-2) [02]
(iii) x[n] = {2, 1 1, 2, 1, -3, 1} [04]
(a) x[2n-1] (b) x[-n+3]

OR

(b) For each of the following systems [08]
i) y(t) = x(t-2) + x(2-t)
ii) y(t) = tx(t)
Determine which of properties "Static/dynamic", "time invariant/Variant", "linear/Nonlinear", "casual/Non causal" holds and justify your answer.

Question: 3.

(a) State properties of LTI System. Prove a condition for a discrete time LTI system to be Causal and Stable. [08]

(b) Determine impulse response for the system given by the following differential equation. [04]
y(n)+3y(n-1)+2y(n-2) = 2x(n) –x(n-1)

(c) Find a linear convolution for [04]
x(n)= {1,2,4}, h(n) ={1,2}

OR

(a) Compute convolution for the following [08]
(i) $x(n) = (1/5)^n u(n), \quad h(n) = (1/2)^n u(n)$
(ii) $x(t) = u(t), \quad h(t) = e^{-t} u(t)$

(b) State and prove sampling theorem also mention Nyquist criteria. [04]

(c) Find linear convolution using graphical method for [04]
x(n)= {1,1,1}, h(n)= {1,2,1}

Question: 4.

(a) Define ROC of Z- Transform. State and explain Properties of ROC. [08]

(b) Find Z- Transform for the following also comment on ROC. [04]
(ii) x(n)= u(n+2)
(iii) $x(n)= 2^n u(n)$

(c) Proove that $x(n)*\boldsymbol{\delta(n-n_0)} = x(n-n_0)$ [04]
$x(n). \boldsymbol{\delta(n-n_0)} = x(n_0)$

OR

(a) State and Prove following properties of Z- Transform. [08]
(i) Linearity (ii) Time Reversal (iii) Convolution (iv) Differentiation.

(b) Find the z transform of signal [04]
$x(n) = \cos \omega_0 n \, u(n)$

(c) Find convolution of $x_1(n)$ and x2(n) using Z- Transform. [04]
$x_1(n) = \{1,2,1,2\}$ $x_2(n) = \{1,1,2,2\}$

Question: 5.

(a) Using the partial fraction expansion technique find the inverse z transform of [08]

$$X(z) = \frac{z}{2z^2 - 3z + 1}, |z| < \frac{1}{2}$$

(b) Obtain Trigonometric Fourier series of the periodic rectangular waveform. [04]
f(t) = A, -T/4≤t T/4
= 0 , otherwise

(c) State and Prove time shifting property of Fourier transforms. [04]

OR

(a) Find inverse Z- Transform by Partial Fraction Expansion for all possible x(n) [08]
$X(z) = Z+1/ 2Z^2-7Z+3$

(b) Find Fourier transform of a rectangular pulse 2 seconds long with a magnitude of 10 volts. [04]

(c) State Dirichlet condition for Fourier Transform representation. [04]

Question: 6.

(a) Define Laplace transform. Prove linearity property of Laplace transform. State how ROC of Laplace transform is useful for in defining stability of system. [08]

(b) Define convolution and its importance in analysis of Linear time invariant system. [04]

(c) Define discrete Fourier transform and describe difference between DTFT and DFT. [04]

OR

(a) Derive DFT of the sample data sequence x(n) = {1,1,2,2,3,1}. [08]

(b) State application of signals and systems explain any one in detail. [04]

(c) Define: The continuous time Fourier transforms. State and prove Duality properties of continuous time Fourier Transform [04]

---Best of Luck---

Que. Paper weight-age as per Bloom's Taxonomy

No.	Que. Level	% of weight-age	
		% of weight -age	Que. No.
1	Remember/Knowledge	20	Q:2(a)Q:6(b)Q:6(c)(OR)Q:4(a)Q:6(a) Q:3(a)
2	Understand	25	Q:1(a)Q:2(b)Q:2(b)(OR)Q:3(b)Q:4(c) Q:4(b)
3	Apply	25	Q:1(b)Q:3(c)(OR)Q:4(b)Q:4(C)(OR) Q:5(b)(OR)
4	Analyze	25	Q:3(a)(OR),Q:3(b)(OR)Q:4(a)(OR) Q:5(c)Q:3(c)
5	Evaluate	05	Q:6(b)Q:5(C)(OR)
6	Higher order Thinking		

GRAPH: