

**University Institute of Engineering & Technology**  
(Recognised Under Section 2(f) and 12B of UGC)  
**Kurukshetra University, Kurukshetra**

Roll No. -

**THEORY EXAMINATION - DECEMBER 2018**  
B.TECH - ECE      SEMESTER -III

TIME - 3 Hrs.

M.M. - 75

COURSE NO. - ECE 201

COURSE TITLE - SIGNALS AND SYSTEMS

Note: All questions in Part-A and Part-B are compulsory. Attempt any four questions from Part-C selecting at least one from each unit.

**PART-A (15 Marks)**

Q. No. - 1 Answer the following questions carrying one mark each. 15x1=15

(i)	Define unit impulse function?
(ii)	The time derivative of ramp function is _____
(iii)	Check the causality for the system with output $y(t+1) = (t-1)^* x(t)$ .
(iv)	Explain time scaling.
(v)	Find odd part of $x(t) = 2 \cos(t) + t^2 + \sin(t)$
(vi)	Define unit impulse response.
(vii)	Explain memoryless system.
(viii)	Write the polar form representation of continuous time fourier series.
(ix)	Write the relationship between probability distribution function and probability density function.
(x)	Write the orthogonality condition for two signals $x(t)$ and $y(t)$ over the interval $[0, T]$ .
(xi)	If fourier transform of $x(t) = X(w)$ then fourier transform of $x(t+2)$ is _____.
(xii)	Explain Region of convergence.
(xiii)	The DTFT of $x[n]$ is _____
(xiv)	Region of convergence of a causal system is i) entire s-plane ii) right half of s-plane iii) left half of s-plane iv) does not exist
(xv)	Define nyquist rate.

**PART-B (20 Marks)**

UNIT-I		5
2	Determine whether signal $x(t) = t \cdot u(t)$ is energy or power signal.	
UNIT-II		5
3	Derive the expression for standard deviation of random variable X.	
UNIT-III		5
4	Determine the trigonometric fourier series for periodic signal $x(t) = (5/\pi)t$ for $0 < t < 2\pi$ . The fundamental time period of the signal is $2\pi$ .	
UNIT-IV		5
5	Find the fourier transform for $x(t) = e^{- t }$ .	

**PART-C (40 Marks)**

UNIT-I		
6 (a)	Explain the power signals.	04
6 (b)	Check the periodicity for $x(t) = \text{even}(\cos(4\pi t)u(t))$	05
7	Determine whether the system with output $y(t) = dx(t)/d(t)$ is a) Static      b) Causal      c) Linearity      d) Time invariant e) Stable	10
UNIT-II		
8a)	Explain convolution integral and derive its expression for $y(t)$ .	5
(b)	Determine the convolution sum for $x[n] = u[n-1]$ and $h[n] = a^n u[n-1]$ .	5
9(a)	Explain Autocorrelation with properties	5
(b)	Determine the variance of X if $f_X(x) = (1-x^2)$ for $0 \leq x \leq 2$	5
UNIT-III		
10	Explain reconstruction of a signal from its samples.	10
11	Derive the expression for $X_n$ and represent the periodic signal $x(t)$ in terms of exponential fourier series. Also mention the magnitude and phase spectrum of $X_n$	10
UNIT-IV		
12a)	Find the fourier transform for $x(t) = \cos(\omega_c t) u(t)$ .	6
b)	Explain the Differentiation property in frequency domain of fourier transform with proof.	4
13	An LTI system has an impulse response $h(t) = e^{-at}u(t)$ and when it is excited by an input signal $x(t)$ , its output $y(t) = (e^{-bt} - e^{-ct}) u(t)$ . Determine its input $x(t)$ .	10