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

Roll No. -

THEORY EXAMINATION – DECEMBER 2016

TIME – 3 Hrs.

B.TECH - ECE	SEMESTER – 3rd

M.M. - 75

COURSE NO. ECE- 201   COURSE TITLE - SIGNALS AND SYSTEMS

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)= x(sin(t)).
(iv)	Calculate the period of signal x(t) = 10sin (4*pi*t)+ cos(4*pi*t).
(v)	Write the relationship between PDF and CDF.
(vi)	Define impulse response h(t).
(vii)	The condition $\int_{-\infty}^{\infty} |h(t)|dt < \infty$ must be satisfied by the system that is a) Memoryless b) Causal c) BIBO stable d) Invertible
(viii)	Mention whether the autocorrelation function is an even function or odd.
(ix)	Define nyquist rate.
(x)	The Fourier series of a real, even periodic signal will contain only a) Cosine terms b) Sine terms c) Even terms d) Odd harmonics
(xi)	The fourier transform of 1/(2*pi) is_____
(xii)	Write the time shifting property of fourier transform.
(xiii)	The DTFT of x[n]=a^n u[n] is _____
(xiv)	Define Region of convergence.
(xv)	The laplace transform of unit impulse function is _____

Answer the following questions, one from each unit & all questions carrying equal marks. 5x4=20

	UNIT-I	
2	Explain energy and power signals. Calculate energy and power for the signal $X[n] = \cos[pi*n /4]$.	5
	UNIT-II	
3	Explain random variable and random process. Also determine the expression for variance.	5
	UNIT-III	
4	Consider the continuous time signal x(t)= 3cos (2000*pi*t) + 5 sin (6000*pi*t) a) Determine Nyquist rate and nyquist interval. b) If the signal is sampled at f_s = 5000 samples/sec. Determine the discrete time signal obtained after sampling	5
	UNIT-IV	
5	Compute the initial and final values for $X(s)= 8s+12/s \ (s+3) \ (s+5)^2$	5

PART-C (40 Marks)

Students are required to attempt **four questions**, by selecting **atleast one question from each unit** & all questions carrying equal marks. 10x4=40

	UNIT-I	
6 (a) 6 (b)	Explain different singular functions with their relationship with each other. Draw the waveforms for the following signals. a) $x_1(t)= r(t) - 2 \ r(t-1)+ r(t-2)$ (b) $x_2(t)= dx_1(t)/dt$	05 05
7	The following system have input x[n] and output y[n]. y[n]= odd (x[n]) Determine whether the system is a) Memoryless b) Stable c) Causal d) Linear e) Time-invariant	10
	UNIT-II	
8	Explain the convolution sum. Also calculate the convolution of the two sequences. x[n] = { 1,4,6,7,9} and h{n}= { 4,7, 3}	10
9	Write the properties of cross correlation function with proof.	10
	UNIT-III	
10	Explain sampling theorem and the interpolation process used for reconstruction of signals	10
11	Determine the trigonometric fourier series for $x(t) = \begin{cases} A \sin(t), & 0 < t < \pi \\ 0, & \pi < t < 2\pi \end{cases}$ Also plot the line spectrum.	10
	UNIT-IV	
12(a) 12(b)	Find the fourier transform for x[n]= cos(w_on) u(n) using multiplication property. The causal LTI system have frequency response H(w) = 1/3+jw. Determine the input x(t) if output $y(t) = e^{-3t} u(t) – e^{-4t} u(t)$.	5 5
13	State and prove the properties of Laplace transform.	10