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

Roll No. - 25180125

THEORY EXAMINATION – DECEMBER 2019		TIME – 3 Hrs.
B.TECH - ECE	**SEMESTER – III**	**M.M. - 75**

PAPER - EC- 209	SUBJECT - 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 signum function?
(ii)	The multiplication property of impulse funtion $x(t).\delta(t)$= ....
(iii)	Check the stability for the system with output $y(t)= (t +1)* x(t)$.
(iv)	Plot u(3t-2).
(v)	Find even part of $x(t)= t^2+ t+3$
(vi)	A discrete time LTI system is stable iff.....................
(vii)	Explain static system.
(viii)	Write the polar form representation of continuous time fourier series.
(ix)	Define probability distribution function .
(x)	The DTFS coefficient of a real and periodic signal are (a) real and odd (b) imaginary and even (c) real and even (d) imaginary and odd.
(xi)	If fourier transform of x (t) = X (□) then fourier transform of dx(t)/dt is _____ .
(xii)	The inverse fourier transform of X (□) = δ(□) is.............................
(xiii)	The DTFT of x[n] is _____
(xiv)	If X(s) is rational then ROC must not contain................
(xv)	Define interpolation.

PART-B (20 Marks)

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

	UNIT-I	
2	Determine whether signal $x[n]= \cos(\frac{\pi}{4} n)$ is energy or power signal.	5
	UNIT-II	
3	Write the properties of probability density function.	5
	UNIT-III	
4	Let $x(t)$ be a periodic signal with fundamental period T and fourier series coefficients X_n. Derive the fourier series coefficient for $y(t)= \text{even}(x(t))$.	5
	UNIT-IV	
5	Derive the expression for fourier transform for periodic signal $x(t)$ with period T and Fundamental frequency $\square_o$.	5

PART-C (40 Marks)

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

	UNIT-I	
6 (a)	Explain periodic signals with properties.	05
6 (b)	Find and plot even and odd components of $x(t)=u(t)$	05
7	Determine whether the system with output $y(t)= x(\sin(t))$ is a) Static b) Causal c) Linearity d) Time invariant e) Stable	10
	UNIT-II	
8a)	Explain autocorrelation with its properties.	5
(b)	Evaluate the step response for LTI system represented by $h[n] =(-1)^n (u[n+2]-u[n-3])$.	5
9(a)	Determine the convolution integral of $x(t)=h(t)= A \, \text{rect}(t/2T)$	5
(b)	Determine the variance of X if $f_X(x) = ae^{-ax}$ for $x >0$ and $a=$ constant, $f_X(x)=0$ otherwise	5
	UNIT-III	
10	State sampling theorem and derive the expression for sampled signal in frequency domain.	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	
12	State and prove the properties of Fourier transform.	10
13	An LTI system with unit step response given by $s(t)= (1-e^{-t}-te^{-t})u(t)$. For a certain input $x(t)$, the output is observed to be equal to $y(t)= (2-3e^{-t}+e^{-3t})u(t)$. Determine $x(t)$.	10