Reg No.:_____ Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

Third Semester B.Tech (minor) Degree Examination December 2020

Course Code: ECT285
Course Name: INTRODUCTION TO SIGNALS AND SYSTEMS

Max. Marks: 100 Duration: 3 Hours

PART A

Answer all questions. Each question carries 3 marks Marks

1	Distinguish between deterministic and random signals with suitable example.	(3)
2	Find the energy of the continuous signal $x(t) = e^{-2t}\, u(t)$.	(3)
3	Differentiate between discrete time periodic and non-periodic signals with example.	(3)
4	Define the signal u(n) ad hence sketch the sequence u(n+2)-2u(n)+u(n-2).	(3)
5	Define Linearity and Shift invariance property in systems.	(3)
6	What is BIBO stability?	(3)
7	Find the autocorrelation of the sequence x(n)= {3,2,4,1}for n in range 0:3.	(3)
8	What are the properties of convolution sum?	(3)
9	Explain sampling theorem.	(3)
10	Comment about the spectrum of Continuous Time and Discrete Time Fourier transformed signals.	(3)

PART B

Answer any one full question from each module. Each question carries 14 marks

Module 1

11	(a) Define and sketch the following continuous time signals: (i) unit impulse function (ii) unit step function	(6)
	(b) Find the even and odd components of the given signals: (i) $x(t) = e^{j2t}$ (ii) $x(t)= [\sin(\pi t) + \cos(\pi t)]^2$	(8)
12	(a) For a given composite signal x(t) which is the sum of two periodic signals, explain the steps involved to determine its periodicity condition.	(6)
	(b) Sketch the following signal x(t) = u(t+2) – u(t-2). Also determine whether the given signal is a power signal or energy signal or neither.	(8)

Module 2

13 (a) If x(n) = (1,2,-1,0,2,1,1,0,-1) ; $-4 \leq n \leq 4$, plot the following sequences (6)

(i) x(n-3) (ii) x(-n)

(b) Determine whether the sequence x(n) = sin $(\frac{6\pi n}{7})$ + sin $(\frac{\pi n}{8})$ is periodic or not. If periodic, determine the fundamental period. (8)

14 (a) A discrete time sequence is given by x(n) = (1,1,1,1,2,2). Sketch

(i) x(n) – x(n-2) (8)

(ii) x(n)u(n+2)

(b) Describe any two standard discrete time signals. (6)

Module 3

15 (a) Determine whether the following systems are Linear or Non Linear.

(i) $y(t) = x^2(t)$ (8)

(ii) $y(n) = e^{x(n)}$

(b) Explain stability and causality of a system. (6)

16 (a) Explain Static and Dynamic Systems. Is the discrete time system described by the equation y(n) = x(n-1) is static or dynamic? (6)

(b) Determine whether the following systems are Shift invariant or not.

(i) y(t) = x(-t) (8)

(ii) y(n) = A x(n) + B

Module 4

17 (a) Consider a discrete time LTI system with impulse response h(n) given by h(n) = $(1/2)^n$ u(n). Determine if the system is Causal and BIBO stable? (8)

(b) Find the output signal y(n) of an LTI system ,if the input sequence is x(n) = {1,1,1,1)}and impulse response h(n) = {2,2}. (6)

18 (a) Find the convolution of the signal,

$x(t) = e^{-t}$; $t \geq 0$

$= 0$; $t < 0$ with the signal (8)

$h(t) = 1$; $0 \leq t \leq 3$

$= 0$; otherwise

(b) Prove that convolution of a function x(t) with a unit impulse function $\partial(t)$ results in the function x(t) itself. (6)

Module 5

19 (a) An analog signal is expressed by the equation

$$x(t) = \frac{1}{\pi}[\cos(5000\pi t) + \cos(3000\pi t)] \quad (6)$$

Calculate the Nyquist rate ?

(b) Find the DTFT of sequences. (8)

(i) Unit impulse

(ii) $x(n) = (\frac{1}{2})^n u(n)$

20 (a) State and prove Parsevals theorem for discrete time Fourier transform. (6)

(b) Find the CTFT of the signals. (8)

(i) $x(t) = \cos(w_0 t)$

(ii) $x(t) = 1 ; -T \leq t \leq T$

$= 0$; otherwise

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