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Reg No.:_____ Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

B.Tech Degree S4 (S, FE) / S4 (PT) (S) Examination January 2024 (2019 Scheme)

Course Code: ECT204

Course Name: SIGNALS AND SYSTEMS

Max. Marks: 100 Duration: 3 Hours

PART A

(Answer all questions; each question carries 3 marks) Marks

1		Differentiate between even and odd signals.	3
2		Determine whether the signal given is periodic or not. If periodic, determine fundamental period. Given $x(n)=\cos(3\pi n)$	3
3		Determine the Fourier transform of the signal given : $x(t) = \partial(t)$.	3
4		What is meant by Gibbs' phenomenon?	3
5		Check whether the systems described by the following equation is causal $y(n) = x(n-1) + 3x(n-2)$.	3
6		What is meant by Nyquist rate and nyquist interval?	3
7		Write any 3 properties of DTFS.	3
8		Perform convolution of the sequences $x_1(n) = \{1, 2, 3, 1\}$ and $x_2(n) = \{4, 3, 2, 2\}$.	3
9		Find the unilateral z-transform of $x(n) = a^{n+1}u(n)$.	3
10		Explain ROC and its properties.	3

PART B

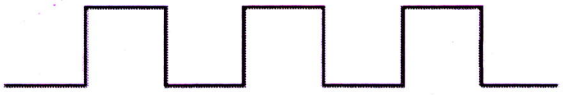
(Answer one full question from each module, each question carries 14 marks)

Module -1

11	a)	A discrete-time system is represented by the following difference equation in which x(n) is input and y(n) is the output: $y(n) = 3y^2(n-1) - nx(n) + 4x(n-1) - 2x(n+1)$. Is this system Linear or Shift-invariant or causal?	7
	b)	Examine whether the following signal: $x(n) = \cos\left(\frac{n}{10}\right)\cos\left(\frac{n\pi}{10}\right)$ is a periodic signal or not.	7
12	a)	Determine the energy of the signal $x(t) = \cos(10\pi t)u(t)u(t-2)$.	7
	b)	Test whether the system described by the equation $F[x(n)] = n[x(n)]^2$ is linear and time-invariant.	7

Module -2

13 a) Obtain the Fourier transform of a periodic gate function of amplitude B, period To and width τ assuming that the function is centered on the origin. 7



b) A discrete-time signal is given as x(n) = $a^{|n|}$ for -1 < a < 1. Find the DTFT. 7

14 a) Determine the Laplace transform and ROC for the following signal x(t) = $-e^{at}u(-t)$. 7

b) Determine the Laplace transforms of the following sinusoidal function x(t) = A sin ωt u(t). 7

Module -3

15 a) The transfer function of LTI system is given by H(s) = $\frac{2s-1}{s^2+3s+2}$. Determine the impulse response. 8

b) What is the difference between unilateral and bilateral Laplace transforms? 6

16 Determine the system response y(t) for a system given below to a input x(t) = $e^{3t}u(t)$ and $H(s) = \frac{2s^2+6s+6}{s^2+3s+2}$. 14

Module -4

17 a) Explain the 4 properties of DTFT. 10

b) If nyquist criteria is not met, what will happen to the sampled signal? 4

18 a) Find the frequency response H($(e^{j\omega})$ and impulse response h(n) of a causal discrete time LTI sysem which is characterised by the difference equation given as under: y(n) - (3/4)y(n-1) +(1/8) y(n-2) = 2 x(n). 14

Module -5

19 a) A discrete time signal is expressed as x(n) = δ(n+1) + 2δ(n) + 5δ(n-3) - 2δ (n-4). Find its z- transform. 7

b) Obtain z-transform of x(n) = a^n sin $\omega_o$nu(n). 7

20 a) Determine the response of the following system: x(n+2) -3x(n+1) + 2 x(n) = δ(n) 7

b) Find the z-transform and ROC of the signal x(n) = [3(2^n) – 4(3^n)]u(n). 7

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