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Reg No.:_____ Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

B.Tech Degree S4 (R,S) (FT/WP/PT) Exam April 2025 (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		Define Energy and Power of a signal.	3
2		Determine whether the signal given is periodic or not. If periodic, determine fundamental period. Given x(n)=Sin(3n).	3
3		Determine the Fourier transform of the signal given : x(t) = $tte^{-at}u(t)$	3
4		Give the relationship between Fourier and Laplace transform.	3
5		Check whether the system described by the following equation is causal y(n) = 3x(n-2) + 3x(n+2)	3
6		What is meant by sampling rate and sampling interval for perfect reconstruction?	3
7		Explain any 3 properties of DTFT.	3
8		Perform convolution of the sequences $x_1(n)$ = {1, 1, 2, 1} and $x_2(n)$ = {1, 2, 3, 4}	3
9		Find the unilateral z-transform of x(n) = $a^n u(n)$	3
10		Write any 3 properties of Z transform.	3

PART B

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

Module -1

11	a)	Check the following system for linearity: i) y(t) = 5sin x(t), ii) y(t) = 7x(t) + 5.	7
	b)	Determine which of the following signals are periodic. If the signal is periodic, find the fundamental period: i) x(t) = 8sin(400 πt) ii) x(t) = 5 + t^2.	7
12	a)	Check whether the system described by the equation F[x(n)] = $a[x(n)]^2$ + bx(n) is linear and time-invariant.	7

b) Check whether the following systems are stable or not i) y(n) = cos x(n) ii) y(n) = $\sum_{k=-\infty}^{n+1} x(k)$. 7

Module -2

13 a) A discrete time signal x(n) is given as x(n) = $a^n u(-n+1), obtain DTFT$. 7

b) State and prove Parseval's theorem. 7

14 a) Evaluate the Laplace transform of x(t) = $e^{at}u(t)$ and plot ROC. 7

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

Module -3

15 Determine the steady state response of the following system to unit step excitation: H(s) = $\frac{s+1}{s^2+3s+2}$. 14

16 a) A continuous-time LTI system is initially relaxed and is represented by the equation y"(t) +3y'(t) +2 y(t) = 2x(t). Determine transfer function of the system and determine impulse response of the system. 14

Module -4

17 a) Explain the 4 properties of DTFS. 10

b) Explain aliasing. How can it be avoided? 4

18 a) Find the frequency response H($e^{j\omega}$)and impulse response h(n) of a causal discrete-time LTI system which is characterised by the difference equation given as y(n) – A y(n-1) = x(n). 14

Module -5

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

b) Evaluate the z-transform of the following signal x(n) = $\left(\frac{1}{2}\right)^n u(n)$. 7

20 a) Consider a causal LTI system with x(n) as input and output y(n) are related by the difference equation y(n) = $\frac{1}{2}y[n-1] + x(n)$. Determine y(n) if x(n) = δ(n-1). 7

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

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