C

0300RAT306052204

Pages: 3

Reg No.:_____ Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

B.Tech Degree S6 (R,S) Exam April 2025 (2019 Scheme)

Course Code: RAT306

Course Name: SIGNALS AND SYSTEMS

Max. Marks: 100 **Duration: 3 Hours**

PART A

Answer all questions, each carries 3 marks. Marks

1	Check whether the signal $x(n) = \sin(5\pi n)$ is periodic or not.	(3)
2	Distinguish between a causal and non-causal signal.	(3)
3	State the time shifting property of continuous time fourier series.	(3)
4	List the conditions for existence of Fourier transform.	(3)
5	Derive the relationship between DTFT and z-transform.	(3)
6	Find the DTFT of $x(n) = u(n)$.	(3)
7	State the time reversal property of DFT.	(3)
8	Find the N-point DFT of $x(n) = \delta(n)$.	(3)
9	Explain the basic operation in DIT algorithm.	(3)
10	Find the number of complex multiplication involved in the calculation of a 1024 point DFT using i) direct computation ii) radix-2 FFT algorithm.	(3)

PART B

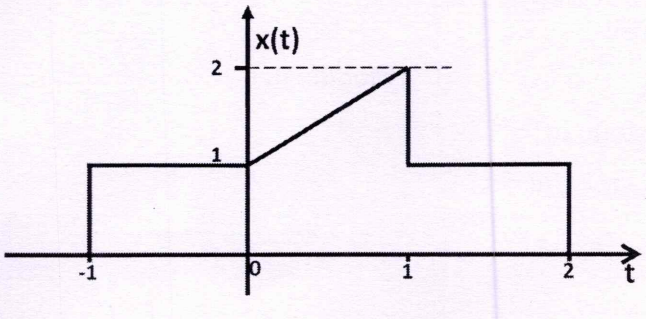
Answer any one full question from each module, each carries 14 marks.

Module I

11 a) For the signal x(t) shown in figure. Find the following (8)

i) $x(2t+2)$ *and* $x(\frac{1}{2}t-2)$

ii) $x(-t+2)$ *and* $x(-t-2)$



b) Check whether the following signals are energy or power signals. (6)

i) $x(n) = \left(\frac{1}{2}\right)^n u(n)$

ii) $x(t) = e^{-5t}u(t)$

OR

12 a) Check the time invariance property of the following systems. (7)

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

ii) $y(n) = x(n) + nx(n-2)$

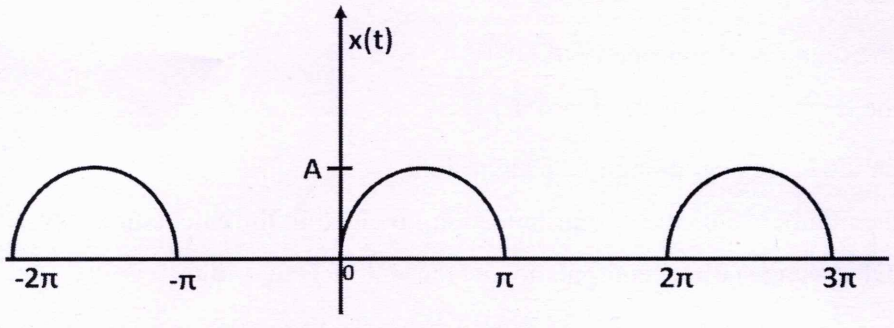
b) Check whether the following systems are Static or dynamic and Causal or non-causal. (7)

i) $y(n) = x(n-2) + x(n)$

ii) $y(t) = x(t) + x(t+1)$

Module II

13 a) Find the CTFS representation of the signal shown in figure. (10)



b) State any four properties of CTFT. (4)

OR

14 a) Find the differential equation description for the system having impulse response $h(t) = (3e^{-3t} - 2e^{-2t})u(t)$ using Fourier transform. (7)

b) Obtain the transfer function of the system if $y(t) = u(t) + e^{-t}u(t) - e^{-3t}u(t) - e^{-4t}u(t)$ and $x(t) = e^{-2t}u(t)$ using Laplace transform. (7)

Module III

15 a) Find the z-transform of (9)

i) $x(n) = \sin \omega_n u(n)$

ii) $x(n) = \delta(n-4)$

iii) $x(n) = r(n)$

b) Find the DTFS representation of $x(n) = \cos\frac{\pi}{4}n$. (5)

OR

16 a) Find the DTFT of (10)

i) $x(n) = 0.5^n u(n) + 2^n u(-n-1)$

ii) $x(n) = \delta(n+3) - \delta(n-3)$

b) State four properties of Z transform (4)

Module IV

17 a) Compute the 4-point DFT of the sequence given by $x(n) = \begin{cases} \frac{1}{3}, & 0 \le n \le 2 \\ 0, & otherwise \end{cases}$. (10)

Plot the magnitude and phase spectrum.

b) Obtain the circular convolution of 2 finite duration sequences (4)
$x_1(n) = \{1, -1, -2, 3, -1\}$ and $x_2(n) = \{1,2,3\}$

OR

18 Find the output $y(n)$ of a filter whose impulse response is $h(n) = \{1,1,1\}$ and (14)
input sequence $x(n) = \{3, -1,0,1,3,2,0,1,2,1\}$ using
i) overlap - save method and ii) overlap - add method.

Module V

19 a) Compute the 8-point DFT of x(n)={2,2,2,2,1,1,1,1} using radix-2 DIF FFT (10)
algorithm.

b) Draw the basic butterfly diagram for radix-2 DIT FFT and radix-2 DIF FFT. (4)

OR

20 Obtain the direct form II and parallel realization for the system whose difference (14)
equation is
$y(n) = -0.1y(n-1) + 0.72\, y(n-2) + 0.7\, x(n) - 0.252\, x(n-2)$.

****