



Reg No.: _____

Name: _____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY
B.Tech Degree S6 (R,S) Examinations April 2026 (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

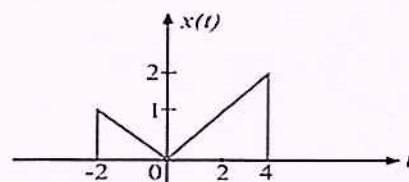
- 1 Determine whether the given signal is Periodic or not. If periodic, determine the fundamental period. Given $x(t) = \cos 20\pi t$ (3)
- 2 State the difference between Continuous time and Discrete time signals. (3)
- 3 Illustrate the relationship between continuous time Fourier Transform (CTFT) and Laplace Transform (LT). (3)
- 4 State sampling Theorem. What is aliasing effect? (3)
- 5 Prove that the Z-Transform of unit step signal $u(n)$ is $z / (z-1)$; with ROC; $|z| > 1$. (3)
- 6 State the condition for existence of Discrete Time Fourier Transform (DTFT). (3)
- 7 Compute N-point DFT of unit impulse signal $\delta(n)$. (3)
- 8 State any three properties of Discrete Fourier Transform (DFT). (3)
- 9 Draw the basic butterfly diagram of DIT algorithm. (3)
- 10 What is twiddle factor? (3)

PART B

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

Module I

- 11 a) Plot the following signals for $x(t)$ (9)
 - (i) $2x(t+2)$
 - (ii) $x(-t-1)$
 - (iii) $x(2t-1)$



- b) Check whether the following signals are energy signals, power signals, neither energy nor power signals. (5)

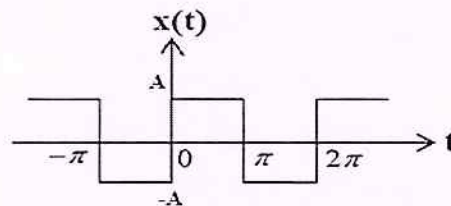
- i) $x(t) = u(n) (1/4)^n$
 ii) $x(t) = e^{-5t} u(t)$

OR

- 12 a) Determine whether the system represented by the $y(t) = at^2x(t) + bt x(t - 4)$ is (8)
 i) Static or Dynamic
 ii) Linear or non-Linear
 iii) Causal or non-causal
 iv) Time-invariant or time variant
 b) Sketch the signals (6)
 (i) $y(t) = 2 r(t - 3)$
 (ii) $y(n) = 2u(n + 3) - 2u(n - 3)$

Module II

- 13 a) Determine the Fourier series expansion of the signal shown in figure. (8)



- b) Find the Fourier transform of $e^{-a|t|}$ (6)

OR

- 14 a) State any 6 properties of continuous time Fourier series with proof. (8)
 b) Find the Laplace Transform and ROC of the signal, $x(t) = e^{-2t} + 3e^{-3t} u(t)$. (6)

Module III

- 15 a) Find the Z-transform and ROC of $X(z)$ for the given signal, (8)

$$x(n) = 3 \left(\frac{5}{7} \right)^n u(n) + 2 \left(-\frac{1}{3} \right)^n u(n)$$

- b) Discuss the relation between discrete time Fourier transform and Z-transform. (6)

OR

- 16 a) Determine the Fourier Transform of the given the signals (8)

(i) $x[n] = \{3, -2, 2, 3\}$

(ii) $x[n] = (0.5) u[n] + 2 u[-n - 1]$

- b) Determine the Z transform of $e^{-j\omega n} \cdot u(n)$ (6)

Module IV

- 17 a) Determine the 8-point DFT of $x(n) = \{1, 0, 1, 1, 1, 1, 0, 0\}$. (10)
 b) Derive the relationship between DFT and z-transform. (4)

OR

- 18 a) Find the circular convolution of the following sequence. (6)
 $x[n] = \{1, -1, 2, 3\}$ and $h[n] = \{0, 1, 2, 3\}$.
 b) Find IDFT of the sequence $X(k) = \{5, 0, 1 - j, 0, 1, 0, 1 + j, 0\}$. (8)

Module V

- 19 a) Find the 8-point DFT of the sequence $x(n) = \{1, 2, 3, 4, 4, 3, 2, 1\}$ using DIT FFT radix2 algorithm. (10)
 b) Differentiate between DIT-FFT and DIF-FFT algorithms. (4)

OR

- 20 a) Draw the direct form 1 and direct form 2 structures for the difference equation (10)
 $y(n) = x(n) + 0.5x(n - 1) + 3y(n - 1) - 2y(n - 2)$.
 b) Draw the basic butterfly diagram for DIF algorithm. (4)
