Reg No.:_____ Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

B.Tech Degree S6 (S,FE) Examination December 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 Find the even and odd components of the signal x(t) = 4+cos2t + Sin3t + Sint Cost. (3)

2 Sketch the signal u(t + 3) – u(t – 2). (3)

3 Find the Laplace Transform of the unit step signal u(t). (3)

4 Write down any three properties of Fourier Transform. (3)

5 Find the Z-Transform of the unit impulse signal δ(n). (3)

6 Find the Discrete Time Fourier Transform (DTFT) of δ(n+3) - δ(n-2). (3)

7 Find DFT of the sequence x(n) = {1,1,0,0}. (3)

8 Find the linear convolution of $x_1(n) = \{1,1,1\}$ and $x_2(n) = \{1,2,3,1\}$. (3)

9 Compare radix2 DIF and DIT algorithm. (3)

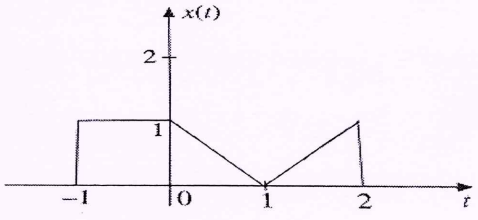
10 Distinguish between FIR filter and IIR filter. (3)

PART B

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

Module I

11 a) Plot the following signals for the given signal x(t) (9)



(i) x (2t + 1)

(ii) $x\left(-\frac{3}{2}t - 2\right)$

(iii) 2 x (-t – 3)

b) Check whether the signals given are periodic or not. If periodic, Find the (5)

fundamental periods.

(i) Cos 20t + Sin 4t.

(ii) u(t) Cos 3t.

OR

12 a) Determine whether the system represented by y(n) = x(n) x(n-1) is (8)

i) Static or Dynamic

ii) Linear or Non-linear

iii) Causal or Non-causal

iv) Time-invariant or time variant

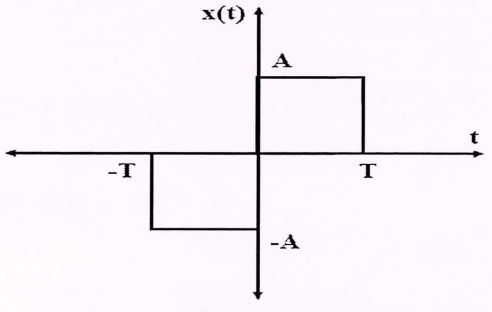
b) Check whether the following signals are energy or power signals. (6)

i) $x(t) = e-a|t|$; a>0

ii) $x(t) = tu(t)$

Module II

13 a) Determine the Fourier Transform of the signal given below: (7)



b) Explain sampling theorem. How can we avoid aliasing? (7)

OR

14 a) Find the Laplace transform and ROC of the two-sided signal (7)

$x(t) = 3e^{-2t}\,u(t) + 4\,e^{3t}\,u(-t)$

b) Determine the Exponential Fourier Series of the following signals. (7)

(i) $x(t) = 2\cos 2\omega_0 t$

(ii) $x(t) = 4\sin 2\omega_0 t$

Module III

15 a) Find the Z-transform of (10)

(i) $y(n) = x\,(n-1)\,u(n)$

(ii) $y(n) = x\,(n+1)\,u(n)$

b) State the properties of the Region of Convergence (ROC) of z-transform. (4)

OR

16 a) Prove that the sequences $x_1(n) = a^n\,u(n)$ and $x_2(n) = -a^n\,u\,(-n-1)$ have the same $X(z)$ and differ only in ROC. (10)

b) List four properties of z-transform. (4)

Module IV

17 a) Perform the linear convolution of the following sequence using overlap add method and overlap save method x[n]= {1,2,3,4,5,6} and h[n]= {2,1, -1}. (14)

OR

18 a) Compute the 8-point DFT of x[n]= {1,2,1,2}. (8)

b) Find the circular convolution of the following sequence. (6)

$x_1[n]$= {1,2,3,4} and $x_2[n]$= {1, -1,2,1}.

Module V

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

b) Draw the basic butterfly diagram for DIT algorithm. (4)

OR

20 a) Obtain the direct form1, direct form 2, cascade and parallel form realisation for the system y(n) = −0.1y (n −1) + 0.2y(n − 2) + 3x(n) + 3.6x(n −1) + 0.6x(n − 2). (14)

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