R22 Regulation *Subject code:4E3DE*

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

(Autonomous, Accredited by NAAC with 'A+' Grade)

B.Tech III Semester Regular/Supplementary Examinations, December 2025

SIGNALS AND SYSTEMS

(ECE)

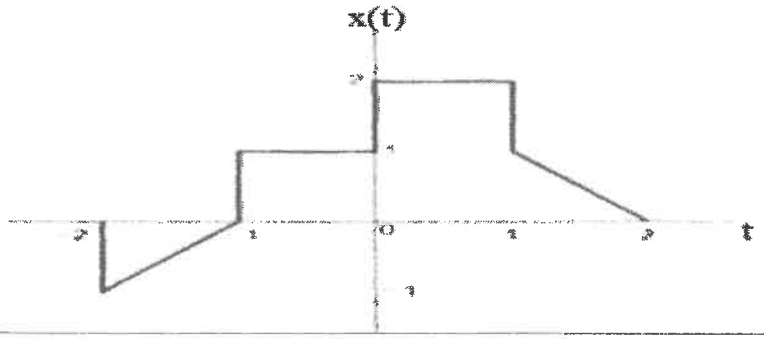
Maximum Marks: 60 Date:24.12.2025 Duration: 3 hours

Note: **1.This question paper contains two parts A and B.**
2. Part A is compulsory which carries 10 marks. Answer all questions in Part A.
3. Part B consists of 5 Units. Answer any one full question from each unit.
4. Each question carries 10 marks and may have a, b, c, d as sub questions.

Part-A

All the following questions carry equal marks (10X1M=10 Marks)		Marks	CO	BTL
1.a)	Define Impulse function.	1M	1	L1
b)	What is the condition for orthogonal functions?	1M	1	L1
c)	What is Dirichlet conditions for existence of Fourier series?	1M	2	L1
d)	State duality property of Fourier transform.	1M	2	L1
e)	What is Region of convergence?	1M	3	L1
f)	State sampling theorem?	1M	3	L1
g)	What are the mathematical operations involved in convolution process?	1M	4	L1
h)	For which type of signals Convolution and Correlation is same?	1M	4	L2
i)	What is impulse response?	1M	5	L1
j)	How to calculate transfer function of LTI System?	1M	5	L1

Part-B

Answer All the following questions. (5X10M=50Marks)		Marks	CO	BTL
2	a) Explain how signals can be approximated using orthogonal functions b) Determine whether the following signal is energy signal or power signal. x(t)=8 cos4t cos6t	5M 5M	1	L2 L3
	OR			
3	A Continuous time signal x(t) is shown in figure below, Sketch and label each of the following signals (i)x(t-1) (ii) x(2-t) (iii) x(2t+1) 	10M	1	L2

4	Derive the relation between exponential Fourier coefficients and trigonometric Fourier coefficients.	10M	2	L3
	OR			
5	Find the Fourier transform of the following signals (i) $x(t)=e^{-3t}u(t)$ (ii) $x(t)=e^{-t}\sin 5t\, u(t)$	10M	2	L3
6	a) State and prove the initial-value theorem of Laplace transform b) Find the inverse Laplace transform of following signal $X(s)=1/(s+2)(s+3)$ with ROC is $Re(s) > -2$	5M 5M	3	L2 L3
	OR			
7	a) Determine the Nyquist rate for the signal $x(t) = \cos(2\pi t)+2\sin(6\pi t)$ b) Explain about aliasing effect, and how it is eliminated in sampling process?	5M 5M	3	L2 L2
8	Prove that autocorrelation function and energy spectral density are Fourier transform pairs?	10M	4	L4
	OR			
9	State and prove any three Properties of auto correlation function?	10M	4	L3
10	a) Explain the condition for distortion less transmission through a system b) Draw Ideal LPF, HPF and BPF characteristics?	5M 5M	5	L2 L2
	OR			
11	a) Explain causality and Paley-wiener criterion for physical Realizable system? b) Explain about State model and State transition matrix?	5M 5M	5	L2 L2