



Paper id: 252584

Printed Page: 1 of 2
Subject Code: KEC403

Roll No:

--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

BTECH
(SEM IV) THEORY EXAMINATION 2024-25
SIGNAL SYSTEM

TIME: 3 HRS**M.MARKS: 100****Note:** Attempt all Sections. In case of any missing data; choose suitably.**SECTION A****1. Attempt all questions in brief.****2 x 10 = 20**

Q. N.	Question	CO	Level
a.	Define the following signals: 1. Unit Impulse 2. Unit Step	1	K1
b.	What is the difference between power and energy signals?.	1	K1
c.	Illustrate time differentiation and time shifting properties of the Fourier series.	2	K2
d.	Define linear shift-invariant (LSI) systems.	2	K1
e.	What is the duality property in the Fourier transform?	3	K1
f.	Describe the trigonometric form of the Fourier series for a periodic signal.	3	K2
g.	Define the Z-Transform of a discrete-time signal.	4	K1
h.	Explain unilateral and bilateral Z-Transform in brief.	4	K2
i.	State the sampling Theorem.	5	K1
j.	What is aliasing and how can it be avoided?	5	K1

SECTION B**2. Attempt any three of the following:****10 x 3 = 30**

Q. N.	Question	CO	Level
a.	A continuous-time signal is shown in the figure below. Sketch the following signals: a) $x(t-1)$ b) $x(2t+1)$	1	K3
b.	Explain the significance of impulse response and step response in determining the behaviour of linear Shift-Invariant (LSI) systems. How are they related? Illustrate your answer with examples.	2	K5
c.	Determine the CTFT of the signal shown in the Figure:	3	K5
d.	Explain the Z-Transform and derive its region of convergence (ROC). Explain the properties of the Z-Transform in detail with suitable examples.	4	K5
e.	State and prove the sampling theorem.	5	K5

SECTION C**3. Attempt any one part of the following:****10 x 1 = 10**

Q. N.	Question	CO	Level
a.	Analyze whether the following properties hold good for the system. $y(t) = atx(t) + bt^2x(t-2)$	1	K4



Roll No:

--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

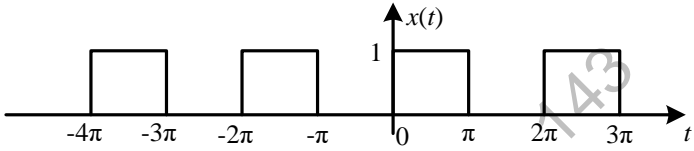
BTECH
(SEM IV) THEORY EXAMINATION 2024-25
SIGNAL SYSTEM

TIME: 3 HRS

M.MARKS: 100

	(i) Static or dynamic (ii) Causal or non-causal	(iii) Linear or non-linear (iv) Time variant or invariant		
b.	Calculate the period of the following signals if they are periodic. (a) $s_1(t) = \sin(15\pi t)$ (b) $s_2(t) = \sin(5\pi t) + \sin(20\pi t)$		1	K3

4. Attempt any one part of the following: 10 x 1 = 10

Q. N.	Question	CO	Level
a.	Determine the Fourier transform of the following signals: (i) $x_1(t) = e^{-At}u(t), A > 0$ (ii) $x_2[n] = \begin{cases} 1, & 0 \leq n \leq 2 \\ 0, & \text{otherwise} \end{cases}$	2	K5
b.	Find the trigonometric Fourier series representation of the signal given below: 	2	K3

5. Attempt any one part of the following: 10 x 1 = 10

Q. N.	Question	CO	Level
a.	A discrete-time LSI system has an impulse response $h[n] = [1, 2, 1]$. The input to the system is: $x[n] = [1, 2]$. Find the output $y[n]$ of the system using convolution.	3	K3
b.	An LTI system is represented by the following difference equation $3y[n] = 5y[n-1] - 7y[n-2] + 4x[n-1]$ for $n \geq 0$. Find the impulse response $h[n]$ with initial rest conditions.	3	K3

6. Attempt any one part of the following: 10 x 1 = 10

Q. N.	Question	CO	Level
a.	Find the z-transform of the following finite duration sequences and write the ROC of each function: (i) $x_1[n] = [1, 2, 3, 4, 0, 1]$ (ii) $x[n] = A^n u[n] + B^n u[-n-1]$	4	K3
b.	Solve the following difference equation using the z-transform $y[n] - 3y[n-1] - 4y[n-2] = 0, n \geq 0$ Given $y[-1] = 5$ and $y[-2] = 0$	4	K3

7. Attempt any one part of the following: 10 x 1 = 10

Q. N.	Question	CO	Level
a.	Calculate the Nyquist rate and the Nyquist interval for the signal. $x(t) = -10\sin(20\pi t)\cos(400\pi t)$.	5	K3
b.	Describe the process of signal reconstruction from sampled data. Compare the (i) Zero order hold and (ii) First order hold methods with suitable diagrams and explanations.	5	K2