Code No: 123AW **R15**

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B. Tech II Year I Semester Examinations, September / October - 2023
SIGNALS AND SYSTEMS
(Common to ECE, EIE)

Time: 3 Hours **Max. Marks: 75**

Note: i) Question paper consists of Part A, Part B.
ii) Part A is compulsory, which carries 25 marks. In Part A, answer all questions.
iii) In Part B, Answer any one question from each unit. Each question carries 10 marks and may have a, b as sub questions.

PART – A

(25 Marks)

1.a)	Define continuous time signals and classify them.	[2]
b)	What is the relation between impulse, step, ramp and parabolic signals?	[3]
c)	Write the formulae for Fourier transform and inverse Fourier transform.	[2]
d)	List out the properties of Hilbert transform.	[3]
e)	Enumerate the properties of LTI systems.	[2]
f)	What is the relation between Bandwidth and Rise time?	[3]
g)	Write the expression for cross correlation of power (periodic) signals.	[2]
h)	Define Normalized energy and Energy spectral density.	[3]
i)	Find the Laplace Transform for the signal x(t)= -5e8t u(t).	[2]
j)	Find the Z-transform and ROC for the signal x(n) = an u(n) 3.	[3]

PART – B

(50 Marks)

2.a) A function f(t) is defined rectangular pulse given by:

$$f(t) = \begin{cases} 1 & 0 < t < \pi \\ -1 & \pi \le t < 2\pi \end{cases}$$

Approximate above function by a finite series of Sinusoidal functions.

b) Obtain the condition under which two signals $f_1(t)$ & $f_2(t)$ are said to be orthogonal to each other. Hence, prove that $\text{Sin}(n\omega_0 t)$ and $\text{Cos}(m\omega_0 t)$ are orthogonal to each other for all integer values of m, n. [5+5]

OR

3.a) Define and derive the expression for evaluating mean square errors and its types.

b) Give the relationship between continuous time unit impulse function f(t), step function u(t) and ramp function r(t). [5+5]

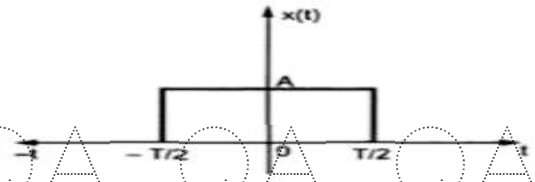
4.a) Briefly discuss about Natural and flat-top sampling.

b) Derive the Fourier transform of $x(t) = e^{-at}\sin(\omega t)u(t)$. [5+5]

OR

5.a) With the help of graphical example, explain sampling theorem for Bandlimited Signals.

b) Obtain the Fourier transform of rectangular pulse of duration T and amplitude A as shown in figure. [5+5]



6.a) Compute the impulse response of the system described by, $y[n]-\frac{1}{2}y[n-1]=x[n]$.

b) Explain the causality and physical reliability of a system and hence give Paley- Wiener criterion. [5+5]

OR

7.a) The unit impulse response h(t) of a CT LTI system is $h(t)=e^{-t}u(t+3)$. Use convolution to compute the system's response to the input x(t)=u(t).

b) Check whether the following system is linear, casual and time invariant or not $d^3 y(t)/dt^3 + 4d^2 y(t)/dt^2 + 5dy(t)/dt + 2y^2(t) = x(t)$. [5+5]

8.a) Find the convolution of the following signals by graphical method. $x(t)=e^{-3tu}(t)$, h(t)=u(t+3).

b) Find the convolution of following functions

x(t)= 1 -3<t<t h(t)= 2 0<t<3

0 otherwise 0 otherwise. [5+5]

OR

9.a) Determine the convolution by graphical method for y(t)=h(t)*f(t) if $h(t)=e^{-t}u(t)$ and $f(t)= e^{-2t}u(t)$.

b) Derive the equation between convolution and correlation. [5+5]

10.a) Find the inverse Laplacian transform of F(s) = -3/(s+2)(s-1).

b) Using scaling property determine the Z-transform of $a^n \cos(\omega n)$ and find its ROC. [5+5]

OR

11.a) Determine the Laplacian transform and ROC of signal $x(t) = -e^{-at} u(-t)$.

b) Find the Z-transform X(n), $x[n] = (1/2)^n u[n] + (1/3)^n u[-n-1]$. [5+5]

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