R18

Code No: 153BT

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B. Tech II Year I Semester Examinations, December - 2019
SIGNALS AND SYSTEMS
(Common to ECE, EIE)

Time: 3 Hours   Max. Marks: 75

Note: This question paper contains two parts A and B.
Part A is compulsory which carries 25 marks. Answer all questions in Part A. Part B
consists of 5 Units. Answer any one full question from each unit. Each question carries
10 marks and may have a, b as sub questions.

PART – A
(25 Marks)

1.a)	List out the properties of an impulse function.	[2]
b)	State the Dirichlets conditions for convergence of Fourier series	[2]
c)	State the Paley-Wiener criterion for physical realizability of the system.	[2]
d)	Find the Laplace Transform of the signal $x(t) = \sin(t) + \cos(t)$	[2]
e)	What is meant by Aliasing?	[2]
f)	What is complete set of orthogonal functions?	[3]
g)	Find and Sketch the Fourier Spectrum of the signal $x(t) = \dfrac{1}{t}$	[3]
h)	Find and Sketch the conditions for distortion less transmission System.	[3]
i)	Find the Z-Transform of the sequence $x(n) = a^n u(n) - (b)^n u(-n-1)$	[3]
j)	Determine the Autocorrelation Function of a signal $x(t) = e^{-at} u(t)$	[3]

PART – B
(50 Marks)

2.a) Define signal space. Give an example of a signal space, and also define the term 'basis set' for a signal space.

b) Find the even and odd components of an unit step signal, and also show that these components are orthogonal functions.   [5+5]

OR

3.a) If $x(t) = \begin{cases} 1 - |t|; & -1 \le t \le 1 \\ 0 & \text{oterwise} \end{cases}$; then sketch the signal $x\left(\dfrac{-t+1}{2}\right) + x\left(\dfrac{-t-1}{2}\right)$

b) How to approximate a function by set of mutually orthogonal functions. Derive the necessary equations.   [5+5]

4.a) Find the TFS of an even symmetric square wave periodic signal with period T_0.

b) Find the TFS of a Quarter wave odd symmetric periodic signal.   [5+5]

OR

5.a) If $x(t)$ and $X(\omega)$ forms the Fourier Transform pair, then find the Inverse Fourier

Transform of: i) $X(\omega) = \dfrac{1}{1+\omega^2}$ ii) $X(\omega) = \text{sgn}(\omega)$

b) $x(t)$ and $X(\omega)$ forms the Fourier Transform pair, prove that, if $x(t)$ is real and even, then $X(\omega)$ is also real and even.   [5+5]

6. The continuous –time LTI system is described by the following differential equation

$y'(t) + 2y(t) = x(t)$

a) Verify that the impulse response of this system is $h(t) = e^{-2t}u(t)$

b) Is this system i) Memoryless   ii) Causal   iii) Stable. Justify your answer.   [5+5]

OR

7.a) Find the necessary and sufficient condition on the impulse response $h(t)$ such that system is BIBO Stable.

b) Find and sketch the impulse response of an Ideal BPF.   [5+5]

8.a) Determine the Laplace Transform ,also sketch the pole, zero locations, and associated ROC of the signal $x(t) = -e^{-at}u(-t)$, $a < 0$.

b) The input and output relationship of the continuous time system is

$y''(t) - y'(t) - 2y(t) = x(t)$

Determine the step response of the system when the system is causal.   [5+5]

OR

9.a) State and prove Final value Theorem of Z-Transform.

b) If $h(n)$ and $H(Z)$ forms Z-Transform pair, then find the Inverse Z-Transform of

$Z^{-N}H(-Z^{-1})$.   [5+5]

10.a) Derive Relation between correlation and convolution.

b) Find the convolution of the following signal by graphical method

$x(t) = e^{-3t}u(t)$, $h(t) = u(t+3)$ [5+5]

OR

11.a) Determine the output of the system for the input $x(t)$ and the impulse response of the

system is $h(t)$, where $x(t) = \begin{cases} 1; & -0.5 \le t \le 0.5 \\ 0; & otherwise \end{cases}$ and $h(t) = \begin{cases} 1; 0 \le t \le 1 \\ 0; & otherwise \end{cases}$

b) Derive the relationship between Autocorrelation Function and Power Spectral density.   [5+5]

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