JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B.Tech II Year I Semester Examinations, February/March - 2016
SIGNALS AND SYSTEMS
(Common to ECE, EIE, BME)

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, c as sub questions.

PART- A   (25 Marks)

1.a)   Draw the sampling function and mention its properties.   [2]
  b)   What are Dirichlet conditions?   [3]
  c)   Find the Fourier transform of unit step signal.   [2]
  d)   Define aliasing.   [3]
  e)   Distinguish between LTI and LTV systems.   [2]
  f)   Define Signal Bandwidth and System Bandwidth.   [3]
  g)   Show that $x(t) * \delta(t) = x(t)$.   [2]
  h)   State and prove Parseval's Theorem.   [3]
  i)   Find the Laplace Transform of $x(t) = - e^{-at} u(t)$ [2]
  j)   Find the z transform of the sequence $x[n] = \{5,3,-2,0,4,-3\}$ [3]

PART- B   (50 Marks)

2.a)   Explain how a function can be approximated by a orthogonal functions.
  b)   Discuss the concept of Impulse function. Explain how signum function is
       expressed in terms of unit step function?   [5+5]

OR

3.a)   Consider full rectified sine have with peak amplitude '1' and time period '1',
       expand this using exponential Fourier series. Also sketch the spectrum.
  b)   Derive the relation between Trigonometric and exponential Fourier series
       coefficients.   [5+5]

4.a)   State and prove time convolution and time differentiation properties of Fourier
       transform.
  b)   Find the Fourier transform of the signal $x(t) = \frac{1}{a^2 + t^2}$?   [5+5]

OR

5.a)   What is sampling? Explain the need for sampling and clearly discuss the process
       of sampling low pass signals and derive conditions for optimum reconstruction of
       signal.
  b)   Distinguish natural and flat top sampling.   [5+5]

6.a)   Explain properties of LTI system.
  b)   Show that from the knowledge of the impulse response h(t) of a linear system, the
       response of any arbitrary function can be obtained.   [5+5]

OR

7.a)   Obtain the conditions for the distortion less transmission through a
       System.
  b)   Explain causality and physical realizibility of a system and hence give poly-
       wiener criterion.   [5+5]

8.a) Find the Auto-Correlation of $f(t) = \cos(\omega_0 t)$ and sketch.

b) Explain about graphical procedure to perform convolution, with an example.

[5+5]

OR

9.a) Explain detection of periodic signals in the presence of noise by Correlation.

b) Derive the relation between PSDs of input and output for an LTI system. [5+5]

10. Find Laplace transforms and sketches their ROC of $x(t) = e^{-a|t|}$ for $a > 0$ and $a < 0$. Find the inverse Laplace transform of $X(s) = \dfrac{5s+13}{s\,(s^2 + 4s + 13)}$ $Re(s) > 0$.

[10]

OR

11.a) Determine z – transform and sketch the ROC of the following signal $x[n] = a^{|n|}$ for a<1 and a>1.

b) Find the inverse z - transform of $X(z) = \dfrac{z}{z(z-1)(z-2)^2}$ with ROC $|z|>2$. [5+5]

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