

Code No: 09A30402

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY, HYDERABAD

B.Tech II Year I Semester Examinations, May/June-2013

Signals and Systems

(Common to ECE, EIE, BME, ETM, ICE)

Time: 3 hours

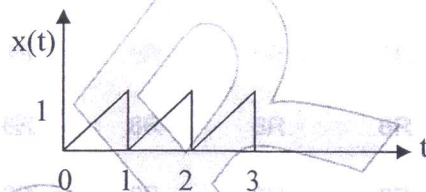
Max. Marks: 75

Answer any five questions

All questions carry equal marks

- 1.a) Define Orthogonal Signal Space and closed or Complete set of orthogonal functions and hence represent a function by a closed or complete set of mutually orthogonal functions.
- b) Derive the expression for approximating a given function $f(t)$ by a set of n orthogonal functions $g_1(t), g_2(t), \dots, g_n(t)$ and also show that the mean square error can be reduced when a function is approximated by a more number of orthogonal functions. [7+8]

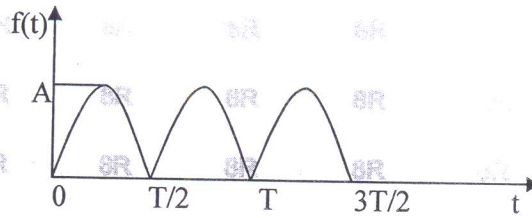
- 2.a) For the Periodic function given below derive the exponential form of Fourier Series and plot magnitude and phase spectrum.



- b) Compute Fourier transform of Standard signals like Unit Step, Unit Impulse, Single Sided exponential, Double Sided Exponential and Gate function. [7+8]
- 3.a) What is an LTI system? Show that an LTI system combined with time scaling property may result in an Time-variant system.
- b) An LTI system with an impulse response $h(n) = 2(\frac{1}{2})^n u(n)$ is excited by the input sequence $x(n)$. Determine the output response of the system for the following input signals
- $x(n) = 5(\frac{3}{4})^n u(n)$
 - $x(n) = nu(n)$.
- [7+8]
- 4.a) State and prove Parseval's Theorem
- b) Find the convolution of two signals $x(n) = \{1, 1, 0, 1, 1\}$ and $h(n) = \{1, -2, -3, 4\}$ and represent them graphically. [7+8]
- 5.a) Define Nyquist rate. Compare the merits and demerits of performing sampling using impulse, Natural and Flat-top sampling techniques.
- b) Discuss the process of reconstructing the signal from its samples. [8+7]
- 6.a) Determine the Laplace transform of
- $f(t) = e^{-at} \sin \omega t$
 - $f(t) = e^{-at} \cosh \omega t$.

b) Find the Laplace transform of the wave form shown below.

[8+7]



7.a) Determine the impulse and unit step response of the systems described by the difference equation $y(n] = 0.6y(n-1) - 0.08y(n-2) + x(n]$.

b) Define Region of Convergence and state its properties w.r.to Z- Transform.

[8+7]

8.a) Show that autocorrelation and power spectral density form a Fourier Transform Pair.

b) Discuss the process of extraction of a signal from noise in frequency domain.

[8+7]

