R09

Code No: 09A30402

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY, HYDERABAD
B.Tech II Year I Semester Examinations, November/December-2013
Signals and Systems
(Common to ECE, EIE, ETM, BME)

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

Answer any five questions
All questions carry equal marks
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1.a) Define a Signal. What are the different types of signals?
b) Derive the expression for component vector C_{12} of approximating the function $f_1(t)$ over $f_2(t)$ and also prove that the component vector becomes zero if the $f_1(t)$ and $f_2(t)$ are orthogonal.
c) Show that the following two signals are orthogonal over a interval [0 1] for $f_1(t) = 2$ and $f_2(t) = \sqrt{3}(1-2t)$. [3+6+6]

2.a) Represent the function e^t over the interval $0 \leq t \leq 1$ by the trigonometric Fourier series.
b) Obtain the exponential Fourier series for the full wave rectified sine wave shown in Figure 1 below. [8+7]

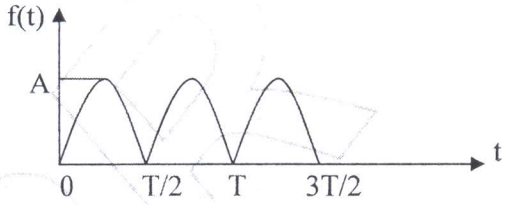

Figure 1

3.a) Define Fourier Transform and State any four properties.
b) Find the Fourier transform of Signum function and double sided real function $e^{-a|t|}$. [7+8]

4.a) Show that the output of an LTI system is given by the convolution sum of the input and system function
b) Determine whether the following systems are Linear and Time Invariant or not.
i) $y(n) = x(n^2)$ ii) $y(n) = x^2(n)$ iii) $y(n) = e^{x(n)}$. [9+6]

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) Define Convolution Theorem in Time and Frequency domain and bring out the expression for convolution in Time domain.
b) Find the convolution of the signals $x(t) = e^{-2t}\,u(t)$ and $y(t) = e^{-4t}\,u(t)$. [8+7]

7.a) Define Laplace Transform and discuss its existence
b) Find Laplace Transform of (i) $x(t) = t^2u(t)$ (ii) $x(t) = e^{-at}\sinh\omega t\,u(t)$. [7+8]

8.a) Determine the inverse Z-Transform of $X(z) = z/(3z^2 - 4z + 1)$, if the region of convergence are (i) $z > 1$ (ii) $z < 1/3$ (iii) $1/3 < z < 1$.
b) Using scaling property determine the Z-transform of $a^n \cos\omega n$ and find its ROC. [8+7]

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