JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B.Tech II Year I Semester Examinations, November - 2015
SIGNALS AND SYSTEMS
(Common to ECE, EIE, BME, ETM)

Time: 3 hours   Max. Marks: 75

Answer any five questions
All questions carry equal marks
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1.a) Obtain the condition under which two signals $x_1(t)$ and $x_2(t)$ are said to be orthogonal to each other.
 b) Show that the following signals are orthogonal to each other.
  $x_1(t)=2$ and $x_2(t)=\sqrt{3}(1-2t)$
 c) State and prove the properties of the unit impulse function.   [5+5+5]

2.a) Discuss the type of symmetry present in waveform and how does it help in simplifying the calculations of fourier series coefficients.
 b) Obtain the Fourier components of a periodic rectangular waveform

$$x(t)=\begin{cases} 0, & for \quad \dfrac{-T}{2}\leq t\leq \dfrac{-T}{4} \\ A & for \quad \dfrac{-T}{4}\leq t\leq \dfrac{T}{4} \\ 0 & for \quad \dfrac{T}{4}\leq t\leq \dfrac{T}{2} \end{cases}$$
                                                                            [7+8]

3.a) Find the Fourier transform of: i) $e^{-A|t|}\,sgn(t)$ ii) $e^{-2t}\cos 5t\, u(t)$.
 b) State and prove the properties of Hilbert transform.   [8+7]

4.a) Consider a stable LTI system that is characterized by the differential equation
$$\frac{d^2 y(t)}{dt^2}+\frac{dy(t)}{dt}+3y(t)=\frac{dx(t)}{dt}+2x(t)$$
  Find the response for input of $x(t)=e^{-t}u(t)$.
 b) Using the Paley wiener criterion, show that whether the amplitude function
  $H(j\omega)=\dfrac{1}{\sqrt{(1+\omega^2)}}$ is realizable or not.   [8+7]

5.a) Discuss the relation between the convolution and correlation.
 b) Prove that $R_{12}(\tau)=R_{21}^{*}(\tau)$ i.e. cross correlation exhibits complex conjugate symmetry.   [8+7]

6.a) What is aliasing? Discuss the effects of it. And how to eliminate aliasing?
 b) Determine the nyquist sampling frequency and nyquist interval for:
  i) $5\cos 1000\pi t\cos 6000\pi t$ ii) $[\sin(100\pi t)/\pi t]^2$ [7+8]

7.a) Discuss the relation between the Laplace transform and Fourier transform.
  b) Prove that the signals (i)e^{-at} u(t) and (ii) - e^{-at} u(-t) have same X(S) and differ only in ROC and plot the ROC's of corresponding signals. [7+8]

8.a) Distinguish between the one sided and two sided Z-Transform.
  b) Find the Inverse Z-Transform of: i)$e^{z}+e^{1/z}$ ii) $Z^{-1}/(3-4Z^{-1}+Z^{-2})$. [5+10]

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