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JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

3067

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

1.a) Obtain the condition under which two signals x₁(t) and x₂(t) are said to be orthogonal to each other.

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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]

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- 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

$$x(t) = \begin{cases} 0, & for \quad \frac{-T}{2} \le t \le \frac{T}{4} \end{cases}$$

$$x(t) = \begin{cases} A & for \quad \frac{-T}{4} \le t \le \frac{T}{2} \end{cases}$$

$$0 & for \quad \frac{T}{4} \le t \le \frac{T}{2} \end{cases}$$

$$17+81$$

- 3.a) Find the Fourier transform of: i) $e^{Att} \operatorname{sgn}(t)$ 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

$$\frac{d^2y(t)}{dt^2} + \frac{dy(t)}{dt} + 3y(t) = \frac{dx(t)}{dt} + 2x(t)$$

Find the response for input of $x(t)=e^{-t}u(t)$.

b). Using the Paley wiener criterion, show that whether the amplitude function

$$H(j\omega) = \frac{1}{\sqrt{(1+\omega^2)}}$$
 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 1000nt cos 6000nt ii) [sin(100 nt)/ nt]²

[7+81]

- 7.a)
- Discuss the relation between the Laplace transform and Fourier transform.

 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] b)

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Distinguish between the one sided and two sided Z-Transform. 8.a)

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i)e^z+e^{1/z} ii) $Z^{-1}/(3-4Z^{-1}+Z^{-2})$. Find the Inverse Z-Transform of: [5+10] b)

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