Code No: 53021 **R09**

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B.Tech II Year I Semester Examinations, February/March - 2016

SIGNALS AND SYSTEMS

(Common to ECE, EIE, ETM)

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

Answer any five questions

All questions carry equal marks

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1.a) Define orthogonal signal space and orthogonal vector space. Bring out clearly its applications in representing a signal and vector respectively.

b) Derive the expression by which the mean square error can be evaluated? [8+7]

2.a) Explain the concept of generalized Fourier series representation of signal f(t).

b) State the properties of Fourier series. [8+7]

3.a) Show that the signal m(t) and its Hilbert transform $\hat{m}(t)$ are orthogonal over the entire time.

b) Find the Fourier transform of f (t) = Cos π t; $-\frac{1}{2} \le t \le \frac{1}{2}$ and f (t) = 0; otherwise. [8+7]

4.a) Obtain the conditions for the distortion less transmission through a system. And also define signal bandwidth and system bandwidth.

b) The transfer function of an LTI system is H(ω) is $\frac{16}{4+j\omega}$. Find the response y(t) for an input x (t) = u (t). [7+8]

5.a) Prove that the correlation and convolution functions are identical for even signals.

b) Find the autocorrelation of a triangular function. [7+8]

6.a) Explain briefly reconstruction of signal from its samples.

b) Sketch the spectrum of naturally sampled signal for following cases

i) $\omega_0 = 2\omega_m$

ii) $\omega_0 > 2\omega_m$

iii) $\omega_0 < 2\omega_m$

Where 'ω_0' is frequency corresponding to sampling interval and 'ω_m' is maximum frequency in the spectrum of base band signal. Explain the each sketch. [8+7]

7.a) State and prove the properties of ROC of Laplace transform.

b) Find the signal that corresponds to $X(s) = \frac{6s^2 - 2s + 2}{(s+1)(s^2 + 4s + 13)}$. [7+8]

8.a) Explain the initial value theorem and final value theorem of z-transform.

b) Discuss in detail the relationship between Laplace transform and z-transform. What is the region of convergence for z transform? [8+7]

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