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B.Tech. (ECE) (Electronics & Computer Engg.) (ETE) (Sem. - 4th)

SIGNALS AND SYSTEMS

SUBJECT CODE :BTEC-402 (2011 Batch)

Paper ID : [A1190]

Time : 03 Hours **Maximum Marks : 60**

Instruction to Candidates:

1) Section - A is compulsory consisting of Ten questions carrying Two marks each.
2) Section - B contains Five questions carrying Five marks each and students has to attempt any Four questions.
3) Section - C contains Three questions carrying Ten marks each and students has to attempt any two questions.

Section - A

Q1) a) How do you obtain a discrete time signal from a continuous time signal?

b) State the condition for causality of a system.

c) What are different properties of fourier transform?

d) What do you mean by Ergodicity?

e) Define mutually exclusive events.

f) Define stable and unstable system.

g) What is difference between ideal and practical sampling?

h) Differentiate between union and intersection of events.

i) What do you mean by correlation and how do you classify it?

j) Define probability density function.

Section - B

Q2) Determine the output of the system described by the following differential equation, for the given input:

$$5\frac{d}{dt}y(t)+10y(t)=2x(t) \quad \text{and} \quad x(t)=e^{-3t}u(t)$$

Q3) Discuss the properties of LTI systems with examples.

Q4) The joint pdf of a random signal is given as

$$f_{xy}(x,y)=\begin{bmatrix}\frac{5}{16}x^2y & for \quad 0<y<x<2\\ 0 & elsewhere\end{bmatrix}$$

a) Find the marginal densities.

b) Find $f_y(y/x)$ and $f_x(x/y)$

Q5) What is sampling theorein? Derive the expression for band limited and band pass signal.

Q6) Determine whether the following signals are energy signals, power signals, or neither and find the normalized energy and power (both for each signal):

a) $x(t)=tu(t)$

b) $x(t)=\begin{Bmatrix}t, & 0\le t\le 1\\ 2-t, & 1\le t\le 2\\ 0, & otherwise\end{Bmatrix}$

Section - C

Q7) Write a short note on :

a) Random variables.

b) Random process.

c) Statistical Averages.

Q8) Determine z-transform of $x(n)$ and draw its ROC

$$x(n)=\left[(0.5)^n \sin\frac{\pi n}{4}\right]u(n)$$

Q9) a) A discrete random variable has k equally likely possible values 0, a, 2a, 3a,...(k-1) a. Find mean, second moment and standard deviation.

b) Explain the properties of Auto-correlation function of a random process. Also give proof of each property.

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