C.U.SHAH UNIVERSITY
Winter Examination-2015

Subject Name: Information Theory

Subject Code: 4TE05ITH1   **Branch: B.Tech (EC)**

Semester: 5   **Date: 7/12/2015**   **Time: 2:30 To 5:30**   **Marks :70**

Instructions:
   (1) Use of Programmable calculator & any other electronic instrument is prohibited.
   (2) Instructions written on main answer book are strictly to be obeyed.
   (3) Draw neat diagrams and figures (if necessary) at right places.
   (4) Assume suitable data if needed.

Q-1	**Define the following terms:**	**(14)**
a)	Signal to Noise Ratio.	
b)	Channel Bandwidth.	
c)	Rate of Communication.	
d)	Randomness.	
e)	Cross Correlation.	
f)	Autocorrelation.	
g)	Sample Space.	
h)	Sample Point.	
i)	Random Experiment.	
j)	Random Variable.	
k)	Mutually Exclusive Event.	
l)	Marginal Probability.	
m)	Probability Density Function.	
n)	Cumulative Density Function.	

Attempt any four questions from Q-2 to Q-8

Q-2	**Attempt all questions**	**(14)**
(a)	Draw and explain the block diagram of Model of a Noisy Communication System.	
(b)	Define and explain classification of signals in detail.	
Q-3	**Attempt all questions**	**(14)**
(a)	Explain in detail 'Signal representation by orthogonal signal set'.	
(b)	Write Short Note on Signal Operations.	
Q-4	**Attempt all questions**	**(14)**
(a)	Find trigonometric Fourier series and draw amplitude and phase spectrum of periodic time domain signal g(t) shown in figure below.	

g(t)

1

-2 -1 0 1 2 t
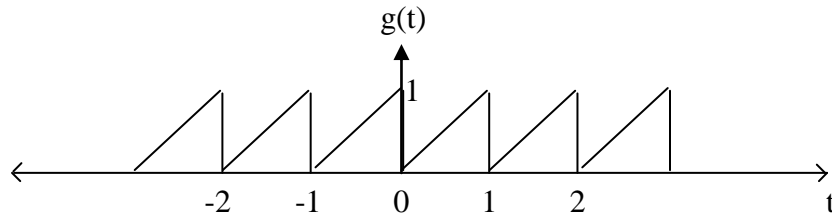
(b) Enlist Fourier Transform Properties and explain time differentiation and time integration with necessary proof.

Q-5 **Attempt all questions** (14)

(a) Define and explain relation between signal energy and energy spectral density.

(b) Explain SSB generation by phase shift method.

Q-6 **Attempt all questions** (14)

(a) Explain Armstrong indirect method for FM generation.

(b) The PDF of amplitude X of a certain signal x(t) is given by $P_x(x) = 0.5|x| \cdot e^{-|x|}$.
Find the probability that (i) $x \geq 1$. (ii) $-1 \leq x \leq 2$. (iii) $x \leq -2$.

Q-7 **Attempt all questions** (14)

(a) Three regular dices are thrown. Assign probabilities to the following events: The sum of the points appearing on the tree dice is (i) 4 (ii) 9 (iii) 15.

(b) A source emits seven messages with probabilities 1/2, 1/4, 1/8, 1/16, 1/32, 1/64, and 1/64, respectively. Find the entropy of the source. Obtain the compact binary code and find the average length of the code word. Determine the efficiency and the redundancy of the code.

Q-8 **Attempt all questions** (14)

(a) For a (6,3) systematic linear block code, the three parity check digits are
c4 = d1+d2+d3, c5 = d1+d2, c6 = d1+d3
i) Construct the appropriate generator matrix for this code and code table.
ii) Determine the error correcting capability.
iii) Decode the received words 101100, 000110, 101010.

(b) Explain Code Tree, Trellis and State Diagram with help of example.