Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

PDDC - SEMESTER–VI • EXAMINATION – SUMMER • 2014

Subject Code: X 61101 **Date: 28-05-2014**

Subject Name: Digital Communication

Time: 10:30 am - 01:00 pm **Total Marks: 70**

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

Q.1	**(a)**	Define random variable and find the mean, the mean square and the variance of the general gaussian random variable.	**07**
	(b)	Define : (i) Auto correlation (ii) PDF and (iii) CDF	**03**
	(c)	Briefly describe the concept of probability with suitable example.	**04**
Q.2	**(a)**	A binary channel matrix is given by y_1 y_2 x_1 2/3 1/3 x1,x2=input y1,y2=output x_2 1/3 2/3 $P_x(x_1)=1/2$ and $P_x(x_2)=1/2$. Determine H(X), H(Y), H(X/Y), H(Y/X) and I (X;Y).	**07**
	(b)	A source emits six messages with probabilities 0.30, 0.25, 0.12, 0.15, 0.10 and 0.08 respectively. Find the entropy of the source. Obtain compact binary code and find the average length of the code word. Determine the efficiency and the redundancy of the code.	**07**
		OR	
	(b)	Derive channel capacity C if channel noise is additive, white Gaussian with mean square value N, given signal power S.	**07**
Q.3	**(a)**	In (3,1) repetition code 0 is transmitted by 000 and 1 by 111. (1) Is this a systematic code? (2) If so, find the generator matrix G.	**02**
	(b)	Derive channel capacity for discrete memoryless channel	**05**
	(c)	1. Construct the systematic (7,4) cyclic code using the generator polynomial $g(x)=x^3+x+1$ 2. What are the error correcting capabilities of this code? 3. Construct the decoding table. 4. If the received word is **1101100**, determine the transmitted data word.	**07**
		OR	
Q.3	**(a)**	"Hamming bound is a necessary but not sufficient condition for higher error correcting codes whereas is a necessary and sufficient condition for single error correcting codes". Justify.	**03**
	(b)	State and explain central limit theorem	**04**
	(c)	Fully explain Delta Modulation with its disadvantages	**07**
Q.4	**(a)**	State, prove and explain the sampling theorem. What is aliasing effect?	**07**
	(b)	What is Inter Symbol Interference? Explain the Nyquist's first criteria for zero ISI	**07**
		OR	
Q.4	**(a)**	Draw and explain block diagram of PCM transmitter and receiver. Explain the quantization process.	**07**
	(b)	What is pulse shaping? Why pulse shaping is done? Explain pulse shaping by traversal filter.	**07**

Q.5	**(a)**	List out desirable properties of line coding. Also find the Power Spectral Density (PSD) of polar signaling.	**07**
	(b)	Discuss optimum binary receiver in brief.	**07**

OR

Q.5	**(a)**	Explain QPSK with waveforms, constellation diagram and mathematical representation.	**07**
	(b)	Explain Binary-Phase Shift Keying (BPSK) technique in detail. What is advantage of Differential Phase-Shift Keying (DPSK) over BPSK?	**07**

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