Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

PDDC - SEMESTER–VI. EXAMINATION – SUMMER 2016

Subject Code:X61101 Date:11/05/2016

Subject Name:Digital Communication

Time:10:30 AM TO 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)**	A binary symmetric channel error probability is Pe. The probability of transmitting 1 is Q, and that of transmitting 0 is 1-Q. Determine the probabilities of receiving 1 and 0 at the receiver.	**07**
	(b)	State and explain the central limit theorem.	**04**
	(c)	Define (i) Mean (ii) Variance and (iii) Standard Deviation for random variables.	**03**
Q.2	**(a)**	A binary source generates digits 1 and 0 randomly with probabilities P(1)=0.7 and P(0)= 0.3. (a) What is the probability that no 1's will be generated in a sequence of 10 digits? (b) What is the probability that eight 1's and two 0's will be generated in a sequence of 10 digits? (c) What is the probability that at least five 0's will be generated in a sequence of 10 digits?	**07**
	(b)	Define the entropy of a discrete memoryless source emitting M symbols and discuss the properties of entropy. A zero memory source emits messages m_1 and m_2 with probabilities 0.8 and 0.2, respectively. Find the optimum binary compact code for this source and its second order extension. Determine code efficiencies in each case.	**07**
		OR	
	(b)	Discuss Shannon's channel capacity theorem. Discuss channel capacity for infinite bandwidth. Show that channel capacity is always finite for finite signal and noise power.	**07**
Q.3	**(a)**	Write short not on comparison of coded and uncoded system.	**07**
	(b)	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)**	Derive Hamming Bound for (n,k) binary t-error correcting block code, where n=length of code word and k=length of data word (n>k). Define perfect code and Hamming codes.	**07**
	(b)	What is the difference between linear block code and convolution code? Explain working of convolution coder. Define efficiency of convolution coder.	**07**

Q.4	**(a)**	Draw and explain block diagram of ADPCM system. Compare PCM and ADPCM.	**07**
	(b)	For ASK modulated signal, derive the expression of bit error probability using non-coherent detection	**07**
		OR	
Q.4	**(a)**	Discuss uniform and non-uniform quantization techniques. What is the advantage of non-uniform quantization?	**07**
	(b)	What is pulse shaping? Why pulse shaping is done? Explain pulse shaping by traversal filter.	**07**
Q.5	**(a)**	For the data stream 10111001 draw the following formats. i)Polar NRZ ii) Split phase manchester iv) AMI NRZ Discuss the desirable properties for selection of line codes.	
	(b)	What are the functions of regenerative repeater? Fully Explain the zeroforcing equalizer with expressions.	
		OR	
Q.5	**(a)**	Explain the detection for PSK with required block diagram.	**07**
	(b)	Define Noise figure. Discuss optimum binary receiver with neat sketches.	**07**

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