Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER– VI (NEW) EXAMINATION – WINTER 2021

Subject Code:2161001 Date:24/11/2021

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.**
4. **Simple and non-programmable scientific calculators are allowed.**

Q.1	**(a)**	Differentiate between Convolutional codes and Block codes.	**[3]**
	(b)	Define cumulative Distribution Function (CDF).What are the important properties of CDF? State and prove them.	**[4]**
	(c)	State and prove Sampling theorem.	**[7]**
Q.2	**(a)**	List the advantages of digital communication over analog communication.	**[3]**
	(b)	Define entropy. Prove that entropy is maximum when all the messages are equiprobable.	**[4]**
	(c)	What is Line coding? Explain the different type of line coding techniques with suitable waveforms.	**[7]**
		OR	
	(c)	What is the difference between coherent and non-coherent detection techniques? Describe non-coherent detection of FSK signal.	**[7]**
Q.3	**(a)**	In a random experiment, a trial consists of four successive tosses of a coin. If we define an RV X as the number of heads appearing in a trial, determine PDF and CDF.	**[3]**
	(b)	What is Eye diagram? Explain the significance of it in the pulse detection technique.	**[4]**
	(c)	A zero memory source emits six massages with probabilities 0.3, 0.25, 0.15, 0.12, 0.1 and 0.08 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.	**[7]**
		OR	
Q.3	**(a)**	List the advantages of M-ary modulation Schemes over Binary Schemes.	**[3]**
	(b)	Derive the expression for Conditional probability (Baye's rule).	**[4]**
	(c)	What is Channel capacity? Derive the equation for channel capacity of a Band-Limited AWGN channel.	**[7]**
Q.4	**(a)**	Explain Minimum Shift Keying (MSK).	**[3]**
	(b)	With diagram explain the principle of Binary Phase Shift Keying (BPSK).	**[4]**
	(c)	State and prove Central Limit Theorem.	**[7]**
		OR	
Q.4	**(a)**	Explain Interlaced Code.	**[3]**
	(b)	Explain quantization in detail. Derive equation for signal to quantization	**[4]**

noise ratio for PCM.

(c) Construct a systematic (7,4) cyclic code using a generator polynomial $g(x) = x^3 + x^2 + 1$. **[7]**

Q.5 **(a)** Compare Amplitude Sift Keying (ASK) with Frequency Sift Keying (FSK). **[3]**

(b) Find the mean, the mean square and the Variance of the general Gaussian random variable. **[4]**

(c) Explain Quadrature Phase Sift Keying (QPSK) modulation. **[7]**

OR

Q.5 **(a)** Define the terms Mean, Central moment and Variance of a Random Variable. **[3]**

(b) Describe Delta Modulation in detail with neat sketches. **[4]**

(c) For a (6,3) Systematic linear block code, the three parity check digits C_4, C_5 and C_6 are $C_4 = d_1 + d_3$, $C_5 = d_1 + d_2 + d_3$ $C_6 = d_1 + d_2$ **[7]**

(a) Construct appropriate generator matrix for this code.

(b) Construct the code generated by this matrix

(c) Prepare suitable decoding table.

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