

GUJARAT TECHNOLOGICAL UNIVERSITY**BE - SEMESTER-VI (NEW) EXAMINATION – SUMMER 2022****Subject Code:2161001****Date:01/06/2022****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.

		MARKS
Q.1	(a) What is PCM ? Explain in brief with transmitter and receiver structure.	03
	(b) Explain Nyquist criteria of sampling with examples?. State the importance of Nyquist criteria in communication.	04
	(c) Explain Delta modulation and Slop overload problem in a brief.	07
Q.2	(a) Enlist the characteristic of line codes.	03
	(b) Explain regenerative repeater in a detail with each sub-block.	04
	(c) In certain binary Communication system, following values of pulses are given. $\Pr(0)= 1$, $\Pr(T_b)= 0.1$, $\Pr(2T_b)= -0.02$, $\Pr(-T_b)= 0.3$ and $\Pr(-2T_b)= -0.07$. Determine the tap setting of three-tap , zero forcing equalizer.	07
OR		
	(c) Explain Scrambler and Descrambler in a detail with diagram.	07
Q.3	(a) State the relation between PDF and CDF with mathematical background.	03
	(b) Explain Central limit theorem in a detail.	04
	(c) Derive the equation to find the probability of error for polar signal.	07
OR		
Q.3	(a) What is M-ary signal? Discuss how much more transmission power is consumed, if the pulses are defined as : -3 , -1, 1 ,3 compared to the On-off signal defined by 0 and 1 only.	03
	(b) Explain the conditional independent probability in a brief.	04
	(c) State the condition of positive correlation, negative correlation and uncorrelated data with examples.	07
Q.4	(a) Explain with mathematical background that Entropy is maximum for equiprobable messages.	03
	(b) Derive the relationship between channel capacity and signal to noise ratio in the light of Shannon's theorem.	04
	(c) A source emits seven messages with probability 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 redundancy of the code.	07
OR		
Q.4	(a) Explain FSK with trans-receiver unit and compare it's bandwidth with ASK.	03
	(b) Explain QPSK with constellation diagram and transmitter and receiver structure.	04

- (c) What is QAM ?. State the merits of QAM. Among the following QAM scheme which has more probability of error for same signal to noise ration, explain with proper insight. **07**
8-QAM, 16- QAM, 32-QAM and 64-QAM.

- Q.5** (a) State the difference between systematic and non-systematic cyclic code. **03**
(b) Explain hamming bound condition with mathematical background. **04**
(c) For the following generator matrix, find the code word for following data sequence. **07**
1. 110
 2. 010
 3. 111

If generator matrix is given as below. $G=[I, P]$, where $I=\begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$ and

$$P=\begin{bmatrix} 1 & 0 & 1 \\ 0 & 1 & 1 \\ 1 & 1 & 0 \end{bmatrix}$$

OR

- Q.5** (a) Explain the decoding process for linear block code. **03**
(b) Explain Convolution code decoding process with examples. **04**
(c) Find the code vector for following data vector for non-systematic cyclic code. If generator matrix $g(x)$ is $x^3 + x + 1$. It is (7,4) cyclic code. **07**
Data vectors are: 1011, 1000, 0101 and 1111.
