Total No. of Questions: 6 *Total No. of Printed Pages:3*

Enrollment No.....

Faculty of Engineering

End Sem (Odd) Examination Dec-2022

EC3CO11 Digital Communication

Programme: B.Tech. Branch/Specialisation: EC

Duration: 3 Hrs. **Maximum Marks: 60**

Note: All questions are compulsory. Internal choices, if any, are indicated. Answers of Q.1 (MCQs) should be written in full instead of only a, b, c or d.

Q.1 i. In digital transmission, the modulation technique that requires minimum bandwidth is- **1**

(a) Delta modulation (b) PCM (c) DPCM (d) PAM

ii. Quantization noise can be reduced by _____ the number of levels. **1**

(a) Decreasing (b) Increasing

(c) Doubling (d) Squaring

iii. In which waveform logic 1 and logic 0 are represented by opposite one-half bit wide pulses- **1**

(a) Unipolar RZ (b) Bipolar RZ

(c) RZ-AMI (d) Manchester coding

iv. Matched filter provides _____ signal to noise ratio. **1**

(a) Maximum (b) Minimum

(c) Zero (d) Infinity

v. Which modulation scheme is also called as on-off keying method? **1**

(a) ASK (b) FSK (c) PSK (d) GMSK

vi. Which filter is used to get the final FHSS signal? **1**

(a) Low pass filter (b) High pass filter

(c) Band pass filter (d) Band stop filter

vii. Binary Huffman coding is a- **1**

(a) Prefix condition code

(b) Suffix condition code

(c) Prefix & Suffix condition code

(d) None of these

viii. Which reduces the size of the data? **1**

(a) Source coding (b) Channel coding

(c) Source & channel coding (d) None of these

P.T.O.

ix. For a (7, 4) block code, 7 is the total number of bits and 4 is the number of- **1**

(a) Information bits (b) Redundant bits

(c) Total bits- information bits (d) None of these

x. For hamming distance d_{min} and t errors in the received word, the condition to be able to correct the errors is- **1**

(a) $2t + 1 \leq d_{min}$ (b) $2t + 2 \leq 2d_{min}$

(c) $2t + 1 \leq 3d_{min}$ (d) None of these

Q.2 i. What is the fundamental difference between uniform quantization and non-uniform quantization? **2**

ii. List out major advantages of digital communication over analog communication system. **3**

iii. Explain differential pulse code modulation with suitable diagram. **5**

OR iv. What is the major advantage of adaptive delta modulation? Explain adaptive delta modulation in detail. **5**

Q.3 i. List out desirable properties of line codes. **3**

ii. What is Inter Symbol Interference (ISI)? List out methods to remove ISI and explain any one method in detail. **7**

OR iii. Write brief note on maximum likelihood detector and show its error performance in white gaussian noise channel. **7**

Q.4 i. Briefly explain Pseudo Noise (PN) sequence generator with suitable diagram. **3**

ii. Explain the concept of DPSK modulation with suitable diagram. **7**

OR iii. Write brief note on frequency hopped spread spectrum system. List out its advantages and limitations. **7**

Q.5 i. Briefly explain "Code-Efficiency" and "Code-Redundancy". **4**

ii. Given the messages X_1, X_2, X_3, X_4, X_5 and X_6 with respective probabilities 0.4, 0.2, 0.2, 0.1, 0.07 and 0.03. Construct a binary code by applying Shannon-Fano encoding procedure. Determine code efficiency and code redundancy of the code. **6**

OR iii. Given messages S_1, S_2, S_3 and S_4 with respective probabilities of 0.4, 0.3, 0.2 and 0.1. Construct a binary code by applying Huffman encoding procedure. Determine the efficiency and redundancy of the code. **6**

Q.6 Attempt any two:

i. Consider a linear block code with the following parity check matrix- **5**

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

(a) Find the corresponding generator matrix.

(b) Obtain the code word for the information sequence [0 1 0 1]

ii. Briefly explain systematic and non-systematic cyclic codes. **5**

iii. Suppose a convolution encoder has generator polynomials $g_1(x) = 1 + x + x^3$ and $g_2(x) = 1 + x^2$. Find the encoder output if the data input to the encoder is d = [10111]. **5**

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8/II

Scheme of Marking

MEDI-CAPS UNIVERSITY Knowledge is Power	Faculty of Engineering End Sem (Odd) Examination Dec-2020 Digital Communication (T) - EC3CO11 (T) Programme: B.Tech. | Branch/Specialisation: EC

Note: The Paper Setter should provide the answer wise splitting of the marks in the scheme below.

Q.1	i)	In digital transmission, the modulation technique that requires minimum bandwidth is (a) **Delta modulation**	**1**
	ii)	Quantization noise can be reduced by _____ the number of levels. (b) **Increasing**	**1**
	iii)	In which waveform logic 1 and logic 0 are represented by opposite one half bit wide pulses? (b) **Bipolar RZ**	**1**
	iv)	Matched filter provides _____ signal to noise ratio. (a) **Maximum**	**1**
	v)	Which modulation scheme is also called as on-off keying method? (a) **ASK**	**1**
	vi)	Which filter is used to get the final FHSS signal? (c) **Band pass filter**	**1**
	vii	Binary Huffman coding is a (a) **Prefix condition code**	**1**
	vii	Which reduces the size of the data? (a) **Source coding**	**1**
	ix)	For a (7, 4) block code, 7 is the total number of bits and 4 is the number of (a) **Information bits**	**1**
	x)	For hamming distance d_{min} and t errors in the received word, the condition to be able to correct the errors is (a) $\mathbf{2t + 1 \leq d_{min}}$	**1**
Q.2	i.	Each Correct comparison carry : **1-Marks** (Students must write at least two correct comparisons to obtain full Marks)	**2**
	ii.	Each correct advantage carry : **1-Mark** (Students must write at least three correct advantages to obtain full Marks)	**3**
	iii.	Block Diagram of DCM Transmitter/Receiver : **3-Marks** Theoretical explanation of DPCM: **2-Marks**	**5**
OR	iv.	Block Diagram of ADM : **2-Marks** Theoretical explanation of ADM: **3-Marks**	
Q.3	i.	Each correct property carry : **1-Mark** (Students must write at least three correct properties to obtain full Marks)	**3**
	ii.	ISI Explanation : **2-Mark** List of Methods to remove ISI: **1-Mark** Explanation of any one method : **4-Marks**	**7**
OR	iii.	. Theoretical explanation of ML: **4- Marks** Error Performance : **3- Marks**	**7**
Q.4	i.	Theoretical Explanation of PN code: **2- Marks** Block Diagram of PN sequence generator : **1- Mark**	**3**
	ii.	Block Diagram of DPSK Transmitter/Receiver : **4-Marks** Theoretical explanation of DPSK: **3-Marks**	**7**
OR	iii.	Block Diagram of FHSS: **2- Marks** Theoretical explanation : **2- Marks** Advantages:**2- Marks** Limitation: **1- Mark**	**7**
Q.5	i.	Explanation of Code Efficiency : **2- Marks** Explanation of Code Redundancy : **2- Marks**	**4**

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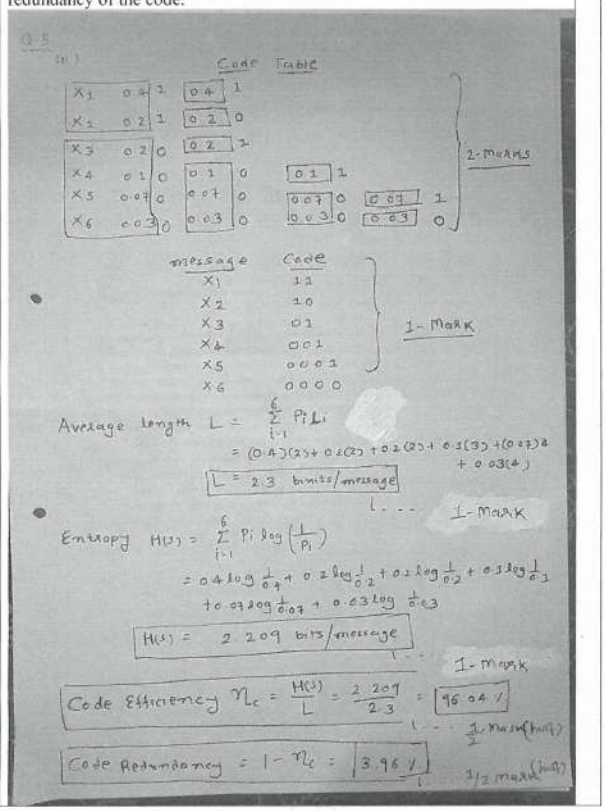
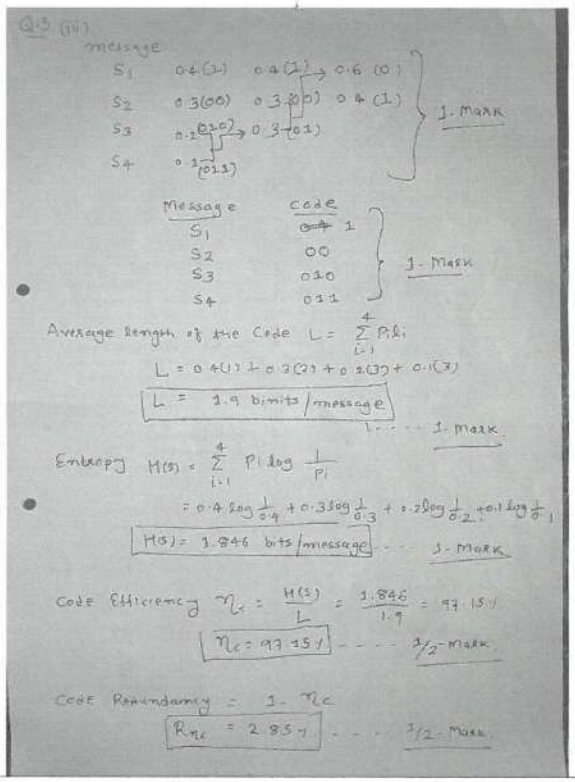
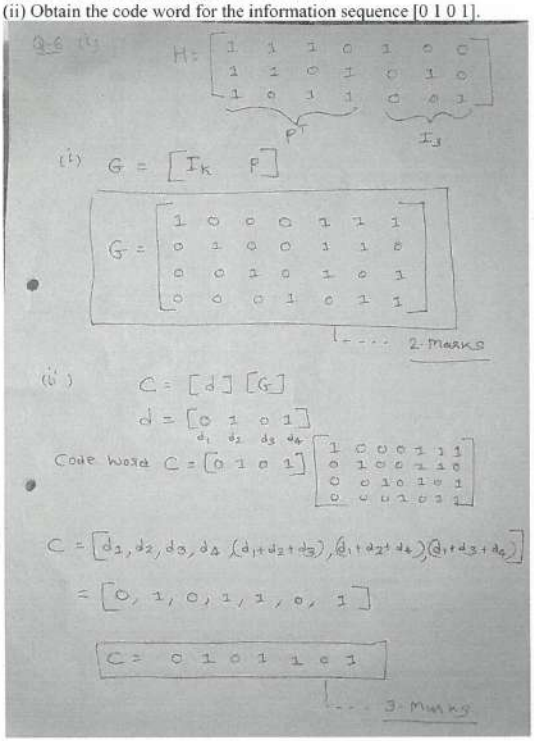
	ii.	Given the messages X_1, X_2, X_3, X_4, X_5 and X_6 with respective probabilities 0.4, 0.2, 0.2, 0.1, 0.07 and 0.03. Construct a binary code by applying Shannon-Fano encoding procedure. Determine code efficiency and code redundancy of the code.	6



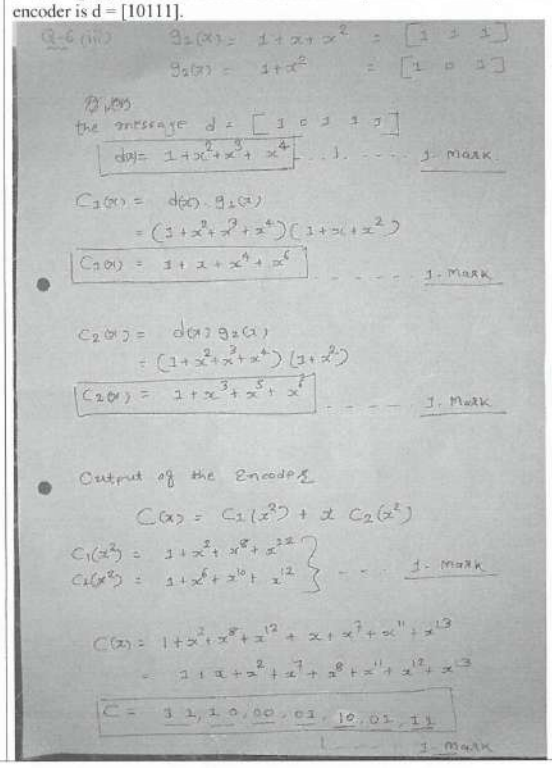
OR	iii.	Given messages S_1, S_2, S_3 and S_4 with respective probabilities of 0.4, 0.3, 0.2 and 0.1. Construct a binary code by applying Huffman encoding procedure. Determine the efficiency and redundancy of the code.	6



Q.6		Attempt any two:	
	i.	Consider a linear block code with the following parity check matrix. $$H = \begin{bmatrix} 1 & 1 & 1 & 0 & 1 & 0 & 0 \\ 1 & 1 & 0 & 1 & 0 & 1 & 0 \\ 1 & 0 & 1 & 1 & 0 & 0 & 1 \end{bmatrix}$$ (i) Find the corresponding generator matrix. (ii) Obtain the code word for the information sequence [0 1 0 1].	5



	ii.	Explanation of Systematic Cyclic Code: **2.5 Marks** Explanation Non Systematic Cyclic Code: **2.5 Marks**	5
	iii.	Suppose a convolution encoder has generator polynomials $g_1(x) = 1 + x + x^3$ and $g_2(x) = 1 + x^2$. Find the encoder output if the data input to the encoder is d = [10111].	5



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