

SEVENTH SEMESTER BTECH. (E & C) DEGREE END SEMESTER EXAMINATION DECEMBER 2021-JANUARY 2022

SUBJECT: Information Theory and Coding (ECE -4075)

TIME: 75 minutes

MAX. MARKS: 20

Instructions to candidates

- Answer **ALL** questions.
- Missing data may be suitably assumed.

Q. No.	Questions	Marks
1A.	Construct a minimum variance Huffman code for the source shown in the	
	following table using the code alphabet $X = \{0,1,2\}$.	
	S <u>s1</u> <u>s2</u> <u>s3</u> <u>s4</u> <u>s5</u> <u>s6</u> <u>s7</u> <u>s8</u> <u>s9</u> <u>s10</u>	
	S S1 S2 S3 S4 S3 S0 S7 S0 S9 S10 P(si) 0.20 0.18 0.12 0.10 0.10 0.08 0.06 0.06 0.04	
	Find efficiency and redundancy of this code.	4
1B.	Let S be zero memory source with source alphabet $S = \{s_i\}, i = 1, 2,, q$, and	
	symbol probabilities P_1, P_2, \dots, P_q . Construct a new zero-memory source S' with	
	twice as many symbols, $S' = \{s'_i\}, i = 1, 2,, 2q$. Let P_i ', the symbol probabilities	
	for the new source, defined by	
	$P_i' = (1 - \epsilon)P_i, \ i = 1, 2,, q$	
	$P_i' = \epsilon P_{i-q}$ $i = q + 1, q + 2,, 2q.$	
	Write $H(S')$ in terms of $H(S)$.	3
1C.	Describe Uniform channel. Describe the mutual information of r-ary	
	symmetric channel with the overall probability of error p. Also identify the	
	capacity of this channel.	3
2A.	A source with 26 alphabets (A-Z) emits a message " shannon ". Generate a binary	
	code for this message using Adaptive Huffman coding algorithm. Show updated	
	tree properly.	5
2B	Explain encoding procedure and update procedure of Adaptive Huffman coding.	3
2C	Justify two real time scenarios for the additivity of Mutual information.	2