



R20 Regulation

Subject code: 307EB

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

(Autonomous, Accredited by NAAC with 'A+' Grade)

B.Tech VII Semester Regular Examinations, November 2023

INFORMATION THEORY & CODING

(Computer Science and Engineering)

(Open Elective)

Maximum Marks: 70

Date:09.12.2023 Duration: 3 hours

- Note:
1. This question paper contains two parts A and B.
 2. Part A is compulsory which carries 20 marks. Answer all questions in Part A.
 3. Part B consists of 5 Units. Answer any one full question from each unit which carries 10M.
 4. Each question carries 10 marks and may have a, b, c, d as sub questions.

Part-A

All the following questions carry equal marks		(10x2M=20 Marks)	Bloom Tx
1	Define Self Information.		L1
2	Define Entropy.		L1
3	State the Shannon's first theorem for source coding.		L1
4	Define code efficiency and variance.		L1
5	Define Hamming distance.		L1
6	What are Linear Block codes.		L1
7	Differentiate block code and convolution codes.		L2
8	What is the value of Syndrome vector for error free transmission.		L1
9	List the disadvantages of convolutional codes.		L1
10	What are uniquely detectable codes.		L1

Part-B

Answer All the following questions.		(5X10M=50Marks)	
11	A. Explain the necessary and sufficient conditions for a code to be instantaneous. Give examples. [5]		L2
	B. A zero memory source has a source alphabet, $S = \{s_1, s_2, s_3\}$ with $P = \{0.5, 0.3, 0.2\}$. Find the entropy of the source. Find the entropy of its second extension and verify. [5]		L3
OR			
12	Define Mutual information. State and prove properties of mutual information. [10]		L2
13	A. Consider a message ensemble $S = \{s_1, s_2, s_3, s_4, s_5, s_6, s_7\}$ with probabilities $P = \{0.45, 0.15, 0.12, 0.08, 0.08, 0.08, 0.04\}$. Construct a binary code and determine its efficiency using Shannon – Fano coding procedure. [5]		L3
	B. Find the capacity of a channel with infinite bandwidth. Discuss Shannon's limit. [5]		L2
OR			
14	Determine the Huffman coding for the following message with their probabilities given $p(x_1) = 0.05, p(x_2) = 0.15, p(x_3) = 0.2, p(x_4) = 0.05, p(x_5) = 0.15, p(x_6) = 0.3, p(x_7) = 0.1$. Find the efficiency and redundancy of the code. [10]		L3

15	Design a linear block code with a minimum distance of 3 and a message block size of 8 bits. [10]	L2
OR		
16	Write short notes on a) Hamming code and their applications [5] b) Huffman coding [5]	L2
17	Explain the need of error correcting codes. How its encoding/decoding takes place? Explain with the help of parity example. [10]	L2
OR		
18	Draw a (2, 1, 3) encoder, if the generator sequences are (1 0 0 0) and (1 1 0 1) respectively. Also find the code vector for the input $u = 1101$ using transform domain approach. [10]	L3
19	A. What is free distance of a convolutional code? [5] B. Write short notes on advantages and disadvantages of convolutional codes [5]	L2 L2
OR		
20	For (2,1,3) convolution encodes with $g(1) = 1011$, $g(2) = 1101$ (i) Write Transition Table (ii) State diagram (iii) Draw the code tree (iv) Draw the trellis diagram (v) Find the encoded Output for the message 11101 by traversing the code tree. [10]	L3