

Total No. of Questions : 08

M.Tech. ECE (Wireless Communication) (2018 Batch) (Sem.-1)

INFORMATION THEORY AND CODING

Subject Code : MTWC-102-18

Paper ID : [75798]

Time : 3 Hrs.

Max. Marks : 60

INSTRUCTIONS TO CANDIDATES :

- 1. Attempt any FIVE questions out of EIGHT questions.**
2. Each question carries TWELVE marks.

- Q1 Discuss the various types of channel. Explain channel capacity and derive the channel capacity for binary symmetric channel.
- Q2 Write short notes on following :
 - a) Turbo code.
 - b) Linear predictive coding.
- Q3
 - a) Explain Shannon's third theorem related to Information capacity theorem. What is Shannon limit?
 - b) Explain the generation of convolution code with an example.
- Q4 Explain Lempel-Ziv algorithm with an example. State the advantages of Lempel-Ziv algorithm over Huffman coding.
- Q5
 - a) A zero-memory source is defined by the table :

| | | | | |
|----------------|----------------|----------------|----------------|----------------|
| \mathbf{S}_i | \mathbf{S}_1 | \mathbf{S}_2 | \mathbf{S}_3 | \mathbf{S}_4 |
| $P(S_i)$ | 0.5 | 0.25 | 0.125 | 0.125 |

Find the entropy and the source information rate if the symbol rate is $v_s = 400$ [symb/sec].

- b) Explain the entropy encoding block of JPEG standard.

- Q6 a) Explain Viterbi algorithm in detail with its significance.
- b) Differentiate LZ and LZW coding based on their utility.
- Q7 Zero-memory binary source emits symbols with rate $\nu_s = 100$. [b/s], the probability of one symbol is $P(x_1) = 0.3$. The corresponding channel is described by transition

$$\text{matrix } P = \begin{bmatrix} 0.4 & 0.6 \\ 0.75 & 0.25 \end{bmatrix}$$

- a) Find the entropy and the information rate of the source.
- b) Find the mutual (transmitted) information and the information rate of the channel.
- Q8 a) Explain uncertainty, information and entropy and differentiate these with an example.
- b) Discuss efficiency of the source encoder and code variance using an example.