

Total No. of Pages: 02
Total No. of Questions: 09

Time: 3 Hrs.

Max. Marks: 60

- 1) *Section- A is Compulsory.*
- 2) *Attempt any four questions from Section- B.*
- 3) *Attempt any two questions from Section- C.*

(10x2=20)

1.
 - (a) Define source entropy in case of discrete and continuous channels.
 - (b) What are cyclic codes? What are its various kinds?
 - (c) What is mutual information of a channel?
 - (d) What is hamming distance?
 - (e) Compare LZ and LZW coding.
 - (f) Explain Viterbi Decoding Algorithm.
 - (g) State and prove Shannon Hartley law.
 - (h) State the need and meaning of error control coding.
 - (i) Explain bandwidth-S/N trade-off.
 - (j) Briefly highlight ARQ schemes.

(4x5=20)

2. Prove that the average information is maximum when the messages are equally likely.
3. (a) Prove that it is not possible to find 32 binary words, each of length 8 bits, such that each word differs from every other word in at least 3 places.
(b) For a (7, 4) cyclic code, the generating polynomial $g(x) = 1+x+x^3$. Find the code word if data is
 - (i) 0011
 - (ii) 0100
 - (iii) Show that how cyclic code is decoded to get word for previous case.

4. What is Nyquist criterion? Prove its sampling theorem mathematically. What is the need of antialiasing filter? How does it affect the distortion?
5. Maximum likelihood algorithm is used for decoding. Show its convergence and implementation in comparison to conventional techniques by taking one example.
6. Discuss in detail convolution decoding procedure using Trellis diagram.

SECTION-C

7. Write short notes on: (2x10=20)
 - (a) RS codes
 - (b) Golay codes
 - (c) Shortened cyclic codes
 - (d) Burst error correcting codes.
8. A (6, 3) linear block code C over GF (2) is defined by the following parity check matrix,

$$H = \begin{pmatrix} 1 & 0 & 0 & 0 & 1 & 1 \\ 0 & 1 & 0 & 1 & 0 & 1 \\ 0 & 0 & 1 & 1 & 1 & 0 \end{pmatrix}$$
 - (a) Find the generator matrix of C.
 - (b) The parity check matrix H does not allow the presence of the code words of weight < 3 (apart from the all zero codeword). Explain why?
 - (c) Suppose that the code is used for error detection only over a binary symmetric channel with error rate $p = 10^{-3}$. Find the probability of undetected error.
9. We have ten messages of probabilities $P(m_1) = 0.49$, $P(m_2) = 0.14$, $P(m_3) = 0.14$, $P(m_4) = 0.07$, $P(m_5) = 0.07$, $P(m_6) = 0.04$, $P(m_7) = 0.02$, $P(m_8) = 0.02$, $P(m_9) = 0.005$, $P(m_{10}) = 0.005$. Find the Shannon Fano code for the set of messages. Find coding efficiency and redundancy.

---END---