

BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(END SEMESTER EXAMINATION)

CLASS: MTECH
BRANCH: ECE

SEMESTER : III
SESSION : MO/19

SUBJECT: EC606 ADVANCED ERROR CONTROL CODES

TIME: 3 HOURS

FULL MARKS: 50

INSTRUCTIONS:

1. The question paper contains 5 questions each of 10 marks and total 50 marks.
2. Attempt all questions.
3. The missing data, if any, may be assumed suitably.
4. Before attempting the question paper, be sure that you have got the correct question paper.
5. Tables/Data hand book/Graph paper etc. to be supplied to the candidates in the examination hall.

Q.1(a) A (7,4) linear block code has the transpose of parity check matrix given by [5]

$$H^T = \begin{matrix} 110 \\ 011 \\ 101 \\ 100 \\ 010 \\ 001 \end{matrix}$$

- (i) Find G.
- (ii) Construct all the codewords for this linear block code.
- (iii) Find d_{\min} .

Q.1(b) Determine the syndrome table for the (6,3) single error correcting code. [5]

$$H = \begin{matrix} 011100 \\ 101010 \\ 110001 \end{matrix}$$

Q.2(a) Given that $v(x) = x^9 + x^8 + x^6 + x^4 + 1$ represents a codeword $c(x)$, of the double error correcting (15,7) code that has incurred 2 errors. Determine $c(x)$. [5]

Q.2(b) Construct the (15,13) single error correcting RS code and determine the systematic codeword corresponding to $i = (0 \ 0 \ \alpha \ 001 \ \alpha^7 \ \alpha^2 \ 001 \ \alpha \ \alpha^2)$ where α is a primitive element of $GF(2^4)$. [5]

Q.3(a) A BSC has a transition probability of $\frac{1}{8}$. If binary transmitted symbol 'X' is such that $P(x = 0) = \frac{9}{10}$, then find out the probability of error of an optimum receiver. [5]

Q.3(b) Decode the received code sequence using Viterbi algorithm. [5]
Y = 11 01 10 01

Q.4(a) Consider the Turbo encoder for 3GPP-LTE given in fig 1. Let the interleaver be 'flip all bits'. Encode the bit stream :00110110.... Using Turbo encoder. [5]

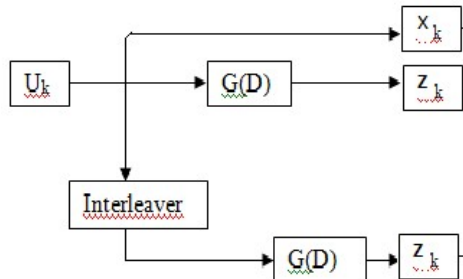


Fig. 1

Q.4(b) Describe SOVA decoder. [5]

Q.5(a) What are LDPC codes? Explain. [5]

Q.5(b) Describe message passing decoders. [5]