R09

Code No: **D3802**, **D6101, D7002, D6501**
JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M.Tech II - Semester Examinations, March 2011
CODING THEORY AND TECHNIQUES
(COMMON TO DIGITAL ELECTRONICS & COMMUNICATION SYSTEMS,
COMMUNICATION SYSTEMS, ELECTRONICS & COMMUNICATION, WIRELESS
& MOBILE COMMUNICATIONS)

Time: 3hours   **Max. Marks: 60**
Answer any five questions
All questions carry equal marks
- - -

1.a) Plot Binary entropy function and write its equation.
  b) Let X denote a random variable, and a, b denote arbitrary constants. If X is discrete,
     how are the entropies H (ax) and H(x+b) related to H(x).
  c) What are the various types of errors?   [12]

2.a) Prove that (n, k) linear block code is capable of correcting 2^{n-k} error patterns.
  b) Draw the block diagram of general decoder for a linear block code and explain it.
  c) Show that the minimum distance d_{min} of an (n, k) linear code satisfies the following
     inequality

$$d_{min} \leq \frac{n.2^{k-1}}{2^k - 1}$$ [12]

3.a)   Draw the encoder circuit for the (7,4) cyclic code generated by $g(x) = 1+x+x^3$.
  b)   Explain how syndrome is computed for cyclic codes and from this how the error
        is detected.   [12]

4.a)   Draw the circuit diagram for error-tapping decoder for the (15,7) cyclic code
        generated by $g(n) = 1+x^4+x^6+x^7+x^8$ and explain it.
  b)   Write the error correcting procedure for BCH codes.   [12]

5.a)   Draw the block diagram of general type-II one step majority-logic decoder and
        explain it.
  b)   Determine the weight enumerator for the entenderd Hamming code of length 2^m.
                                                                           [12]

6.a)   Prove that the number of parity-check digits of an l-burst error correcting code
         must be at least 2 l.
  b)   Explain the error correction process of single Burst error connecting codes.
                                                                           [12]

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7. a) Consider the (3, 1, 2) convolutional code with

$g^{(1)} = (1\ 1\ 0)$
$g^{(2)} = (1\ 0\ 1)$
$g^{(3)} = (1\ 1\ 1)$

    i) Draw the encoder block diagram
    ii) Find the generator matrix.
    iii) Find code word corresponding to the information sequence u = (1 1 1 0 1)
  b) Explain the decoding of convolutional codes based on maximum likelihood criteria.

                                                                            [12]

8.   Write a short note on:
   a) BCH Bounds.
   b) Iterative algorithm.   [12]