Name : .....

Roll No. : .....

Invigilator's Signature : .....

CS/M.Tech (ECE)/SEM-2/MCE-202/2013

2013

ERROR CONTROL CODING

Time Allotted : 3 Hours *Full Marks :* 70

The figures in the margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

Answer Question No. 1 and any *four* from the rest.

GROUP – A

1. Answer *all* the following : 7 × 2 = 14

   a) What is code rate ?

   b) What is hamming bound ?

   c) What is Galois field ?

   d) Define syndrome and syndrome polynomial.

   e) What are the error trapping decoding of cyclic code ?

   f) Define viterbi algorithm.

   g) Explain Reed Solomon code.

GROUP – B

Answer any *four* of the following. $4 \times 14 = 56$

2. a) What is systematic and non-systematic cyclic code ?

   b) Write down the advantages and disadvantages of cyclic code.

   c) Construct the generator matrix for (7, 4) cyclic code using the generator polynomial $g(x) = 1 + x^2 + x^3$.

   4 + 4 + 6

3. For (6, 3) linear block code whose parity check equation defined as $p_1 = x_1 + x_3$ $p_2 = x_1 + x_2 + x_3$ $p_3 = x_1 + x_2$

   Find :

   i) generator matrix

   ii) parity check matrix

   iii) error checking capability

   iv) error check table.

4. Write down short notes on the following : 3 + 3 + 4 + 4

   a) Extended block code

   b) Hamming bound

   c) BCH code

   d) Reed Solomon code.

5. a) Prove that for (n, k) coding t number of error detection is possible if and only if $2^{n-k} \geq \sum_{i=t}^{t} {}^{n}c_i$

   b) Prove that minimum hamming distance is possible for $d_{min} \geq 2t + 1$. For t error correction.

6. a) Write down the advantages and disadvantages of convolution code.

   b) Convolution code describe by $g_1 = [1 \quad 1 \quad 0]$ $g_2 = [1 \quad 0 \quad 1]$ $g_3 = [1 \quad 1 \quad 1]$.

      i) Draw the encoder corresponding to the code.

      ii) Draw state transition diagram.

      iii) Draw Trellis diagram.

7. a) Describe with block diagram decoding mechanism of BCH code ?

   b) Describe maximum likely hood detector.

   c) Show that $x^3 + x + 1$ is an irreducible polynomial over GF (2). 4 + 4 + 6