



Name :

Roll No. :

Invigilator's Signature :

CS/M.Tech(ECE-VLSI)/SEM-2/MVLSI-204B/2012
2012

ERROR CONTROL & CODING

Time Allotted : 3 Hours

Full Marks : 70

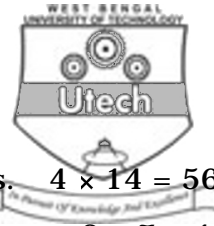
The figures in the margin indicate full marks.

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

GROUP – A

Answer *all* the questions.

1. Explain the error detecting capability of Linear Block Code. 4
2. (7, 4) linear cyclic code has a generator polynomial $g(x) = 1 + x + x^3$. Draw the syndrome circuit and find out the syndrome showing all the contents of the registers in all the required shifts for $r = 0010110$. 3 + 3
3. Explain why an error correcting code must at least satisfy Hamming Bound. What is Hamming Code ? 3 + 1



GROUP - B

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

4. Write short notes on any *two* of the following : $2 \times 7 = 14$

- a) Advantages and disadvantages of convolution code
- b) Standard array
- c) Dual code
- d) Shortened cyclic code.

5. Find the general expression for the probability of error in a binary symmetric Gaussian channel.

6. The parity check bits of a (8, 4) block code are generated by

$$C_5 = d_1 \oplus d_2 \oplus d_4, \quad C_6 = d_1 \oplus d_2 \oplus d_3$$

$$C_7 = d_1 \oplus d_3 \oplus d_4, \quad C_8 = d_2 \oplus d_3 \oplus d_4$$

- a) Find the generator matrix and the parity check matrix for this code.
- b) Find the minimum weight of this code.
- c) Find the error detecting and the error correcting capability of this code. $6 + 4 + 4$

7. a) Construct a decoding table for the (7, 4) cyclic code for the error pattern $e = 1000000$, $e = 0100000$, $e = 0001000$. Assume $g(x) = x^3 + x^2 + 1$. Determine the data vector corresponding to the received vector $r = 1101101$.

- b) Consider $g(x) = x^3 + x + 1$. Design an encoding circuit for (7, 4) cyclic code and determine the output for the input data 1011. $(6 + 3) + (3 + 2)$



8. a) The polynomial $P(x) = 1 + x + x^4$ is a primitive polynomial over $GF(2)$. Find the elements of $GF(2^4)$ and show their polynomial representation.
- b) Determine the generator polynomial of a single and double error correcting BCH code whose block length is 15.
9. The generator polynomial for a cyclic code with block length 7 is $g(x) = 1 + x + x^3$.
- a) Find the parity check matrix H .
- b) How many errors can this code detect ?
- c) How many errors can this code correct ?
- d) Write the generator matrix in the systematic form.
- e) Find the generator polynomial of the dual code.

7 + 7

5 + 2 + 2 + 3 + 2

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