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.

GROUP – A

1. Answer any *ten* of the following briefly :   10 × 2 = 20

    i)   What is Bit Error Rate (BER) ?

    ii)   What is Message Error Rate (MER) ?

    iii)   What is Undetected Message Error Rate (UMER) ?

    iv)   What is encryption ?

    v)   What is decryption ?

    vi)   What is formatting ?

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vii) What is source coding ?

viii) What is channel coding ?

ix) What is coding gain ?

x) What is modulation and demodulation ?

xi) What is a linear block code ? Why is it called as linear ?

xii) For a (n, k) block code what are n and k ? What is the length of a code word of a (7, 4) Linear Block Code ?

xiii) What is n, k, m of a (n, k, m) convolution code ?

xiv) What are the code polynomials of binary cyclic code if the code words are [1111111], [1101111], [1100000].

GROUP – B

Answer any *five* of the following. $5 \times 10 = 50$

2. a) Draw the block diagram of a digital communication system and explain any two blocks of it.

   b) Write down the advantages and disadvantages of digital communication.

3. a) Write short notes on any *two* of the following :

   i) Universe of discourse or domain of discourse

   ii) Frequency spread

   iii) Formatting.

   b) Explain either Forward Error Correction or Hybrid ARQ.

4. a) What is proposition ? Derive the truth table for Negation, Conjunction and Bi-conditional operators.

   b) What is Tautology, Contradiction and Contingency ? Prove that $\rceil$ ($P \vee Q$) and ($\rceil P \wedge \rceil Q$) are logically equivalent.

5. a) What is Existential and Universal Quantifier ? What is the condition of logical equivalence with EX-OR and Bi-conditional operation ? Explain it with an example (truth-table).

   b) What is uniqueness quantifier ? Prove that the existential quantifiers and the universal quantifiers are inclusive OR (?) and Conjunction (?) operations respectively.

6. a) What is Generator matrix ? Why is it called as generator ? For a (7, 4) block code write down the number of bits in message sequence, parity check sequence, code word with example.
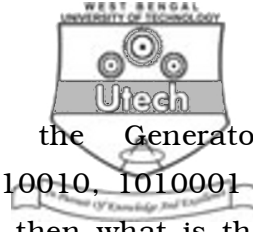
b) For a (7, 4) block code the Generator Matrix G = [1101000, 0110100, 1110010, 1010001] and message sequence U = [1101] then what is the corresponding code word ?

7. a) For a (7, 4) block code parity check matrix

H = [100, 010, 001, 110, 011, 111, 101], the transmitted code word V = [1001011] and r = [1001001] then find out Syndrome (S).

b) Let U = (1010) for a binary cyclic code and the generator polynomial $g(x) = 1 + X + X^2$; then find out the code vector.

8. a) For a (2, 1, 3) binary convolution code $g^{(1)} = [1011]$ and $g^{(2)} = [1111]$. For the message sequence of [1011] find out the code word.

b) For a (2, 1, 3) binary convolution code the generator polynomials are $g^{(1)} D = 1 + D^2 + D^3$, $g^{(2)} D = 1 + D + D^2 + D^3$ and message polynomial $U(D) = 1 + D^2 + D^3 + D^4$; then find out the code word.

9. a) Find the (7, 4) cyclic code generated by $g(X) = 1 + X + X^3$. Let $u(X) = 1 + X^3$ be the message to be encoded and also find the Generator matrix for the aforesaid generator polynomial.

b) Find the generator matrix in systematic form where the last four columns make a 4 × 4 identity matrix I_4.

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