Name : .....

Roll No. : .....

Invigilator's Signature : .....

CS/B.TECH (ECE) (Separate Supple)/SEM-7/EC-703/2011

2011
CODING & INFORMATION THEORY

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
(Multiple Choice Type Questions)

1. Choose the correct alternatives for any *ten* of the following : $10 \times 1 = 10$

   i) 'Decit' is a unit of information when base of the logarithm is :

   a) 2 b) 10

   c) Natural d) 16

   ii) The message 'it will rain' indicates :

   a) Zero information b) Infinite information

   c) Finite information d) None of these.

   iii) A single-error correcting RS code uses a 2-bit symbol, its code rate is given by :

   a) 1/3 b) 1/4

   c) 1 d) 0·5 .

iv) A polynomial is called 'monic' if :

a) Even terms are unity

b) Odd terms are unity

c) Leading coefficient is zero

d) Leading coefficient is unity

v) What is the Hamming distance between codes 10011 & 11000 ?

a) One b) Two

c) Five d) Three.

vi) A message that is sent in cryptography is known as :

a) Machine text b) Plain text

c) Encrypted text d) Decrypted text.

vii) CRC is a method of :

a) Error encapsulation

b) Error detection

c) Error correction

d) Error correction & detection.

viii) What is the value of code rate in a (3, 2) block code ?

a) $0 \cdot 5$ b) $1/3$

c) $2/3$ d) $1 \cdot 5$.

ix) For a code, H is the parity check matrix, the syndrome of a received word R can be defined as :

a) $S^T = R.H$ b) $S^T = R.H^{-1}$

c) $S = R.[H]^{-1}$ d) $S = R.H^T$.

x) The addition of redundant bits means requirement of :

a) High bandwidth b) More bandwidth

c) Less bandwidth d) Equal bandwidth.

xi) Which of the following representations provide the time information ?

a) Trellis diagram b) Code tree

c) State diagram d) None of these.

GROUP – B

(Short Answer Type Questions)

Answer any *three* of the following. $3 \times 5 = 15$

2. What are different types of error control method ?
3. Write down the advantages and disadvantages of cyclic codes.
4. What is the use of syndrome ? Explain syndrome coding.
5. Define block cipher. What do you mean by ciphertext ?

GROUP – C

(Long Answer Type Questions)

Answer any *three* of the following. $3 \times 15 = 45$

6. a) What do you mean by code gain, code rate & code vectors ?

b) For the (7, 4) Hamming code, the parity check matrix H is given by :

$$H = \begin{vmatrix} 1 & 0 & 1 & 1 & 1 & 0 & 0 \\ 1 & 1 & 0 & 1 & 0 & 1 & 0 \\ 0 & 1 & 1 & 1 & 0 & 0 & 1 \end{vmatrix}$$

i) Construct the Generator matrix.

ii) The code word that begins with 1010.

iii) If the received code word Y is 0111100, then decode this received code word. 6 + 9

7. a) What are the five entropies associated with a digital communication channel ? What are their significances ?

   b) Prove that the total information of two or more independent messages or events in the sum of the individual information.

   c) What do you mean by 'Rate of Information' ? 5 + 7 + 3

8. a) Describe the process of 'Decoding of Cyclic codes' with proper diagram.

   b) Compare Block error, Burst error & Bit error.

   c) Draw the encoder for a (7, 3) maximal-length code.

   8 + 5 + 2

9. a) Discuss the basic needs of Network security.

   b) Compare Public key & Private key cryptography.

   c) What is the full form of RSA algorithm ? Discuss RSA algorithm with proper example. 3 + 4+ 8

10. Write short notes (Any *three*) 3 × 5

    a) Viterbi algorithm

    b) CRC

    c) Quantum cryptography

    d) Trellis structure of convolution code

    e) Kraft-McMillan Inequality

    f) DES & its application.