Branch : CSE & IT **Batch : Hinglish**

Computer Network

Error Control

DPP 01

[MCQ]

1. The Hamming distance between 100 and 001 is _____.

(a) 2 (b) 0
(c) 1 (d) None of the above

[MCQ]

2. Consider the following statements:

S_1: If the change occurs in single-bit position with respect to whole data, then such error is called single bit error.

S_2: If the change occurs in two or more-bit positions with respect to whole data, then such error is called burst error.

(a) Only S_1 is true
(b) Only S_2 is true
(c) Both S_1 and S_2 are true
(d) Neither S_1 nor S_2 is true

[MCQ]

3. Which is/are the error detection techniques?

(a) Check sum (b) VRC
(c) CRC (d) All of the above

[MCQ]

4. We add r redundant bits to each block to make the length n = k + r. The resulting n bit blocks are called ______.

(a) Block words (b) Code words
(c) Data words (d) None of these

[MCQ]

5. In block coding, if k=2 and n=3, we have ______invalid codewords

(a) 8
(b) 4
(c) 2
(d) none of the above

[MCQ]

6. A parity check can detect ____.

(a) 1-bit error (b) 2-bit error
(c) 8-bit error (d) None of these

[MCQ]

7. Assume that data has been transmitted on link using the 2D parity scheme for error detection. each sequence of 32-bits is arranged in a 4×8 matrix (rows r_0 through r_3 and column d_0 through d_1) and is p added with a column do and row r_4 of parity bits computed using the even parity scheme. each bit of column d_0 (respectively, row r_4) gives the parity of the corresponding row (respectively column) these 45 bits are transmitted using data link. assuming the following bits (data) are received on receiver's side.

10110011110101011101111010011000001110000001
11

Considering that, first bit that is received by receiver is MSB, then which of the following bit has corrupted during the Transmission.

(a) (r_3, D_6)
(b) (r_2 D_6)
(c) (r_1, D_2)
(d) None of the bit is corrupted

[NAT]

8. Assume a binary code that contains only 5 valid code words as given 0000000, 1010110, 0101111, 0101010, 1101001 and assume minimum hamming distance of a code be x and maximum number of erroneous bits that can be deleted by the code is y and corrected by code be z, then the value of x + y + z is _____

[NAT]

9. Considers the following error deletion scheme. every binary codeword (or) message is 2 bit long and for each binary message [d_1, d_0] three parity bits are appended. corresponding code words are [d_1, d_0, P_2, P_1, P_0]. The appended bits are calculated as $P_2 = d_1 + d_0$, $P_1 = d_1$, $P_0 = d_0$ ('+' is a modulo 2 sum) then the minimum hamming distance d_{min} for this error deletion scheme is ________.

[MCQ]

10. In block coding, if n=5, the maximum hamming distance between two codewords is ________.

(a) 2

(b) 3

(c) 5

(d) None of the above

Answer Key

1. (a)
2. (c)
3. (d)
4. (b)
5. (b)
6. (a)
7. (b)
8. (3)
9. (3)
10. (c)

Hints & Solutions

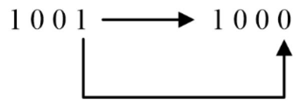
1. (a)

Please refer video solution.

2. (c)

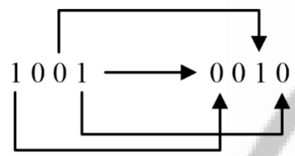
S_1 (True): If the change occurs in single bit position with respect to whole data, then such error is called single bit error

Example:



S_2 (True): If change occurs in two or more-bit positions with respect to whole data then such error is called burst error

Example:



3. (d)

Checksum: This a block code method where a checksum is created based on the data values in the data blocks to be transmitted using some algorithm and append to the data. When the receiver gets this data, a new checksum is calculated and compared with the existing checksum. A non-matching signifies an error.

VRC: It is an error checking method used on an eight-bit ASCII character.

CRC: It is method designed to detect errors in the data and information transmitted over the network.

4. (b)

We add r redundant bits to each data words and resulting word is called as codewords of length n = k + r

5. (b)

Please refer video solution.

6. (a)

A Parity check can detect 1 bit error.

Parity check: A parity bit is added to a block of data for error detection purpose. The value of parity bit is assigned either 0 or 1 which makes the number of 1's in the message block either even or odd depending upon the type of parity.

7. (b)

	D_8	D_7	D_6	D_5	D_4	D_3	D_2	D_1	D_0
R_0	1	0	1	1	0	0	1	1	1
R_1	1	0	1	0	1	0	1	1	1
R_2	0	1	1	1	1	0	1	0	0
R_3	1	1	0	0	0	0	0	1	1
R_4	1	0	0	0	0	0	1	1	1

Therefore, corrupted bit is (R_2, D_6), hence option b is correct.

8. (3)

The minimum hamming distance here is 2 between 0101111 and 0101010, therefore value of x is 2, to detect 'd' bit errors, hamming distance must be d + 1, therefore number of bits that can be detected is y = 1, to correct d bit error, hamming distance must be 2d +1.

∴ The number of bits that can be corrected is '0', hence value of x + y + z = 3

9. (3)

Firstly, finding the numbers of codewords

D_1	D_0	P_2	P_1	P_0
0	0	0	0	0
0	1	1	0	1
1	0	1	1	0
1	1	0	1	1

Now finding d_{min}, to find d_{min} we perform X – OR operations on all the code word and select the minimum numbers of 1 that will give us minimum distance.

0 0 0 0 0
0 1 1 0 1
0 1 1 0 1

Number of 1's is 3

0 0 0 0 0
1 0 1 1 0
1 0 1 1 0

Number of 1's is 3

0 0 0 0 0
1 1 0 1 1
1 1 0 1 1

Number of 1's is 4.

$$\begin{array}{ccccc} 0 & 1 & 1 & 0 & 1 \\ 1 & 0 & 1 & 1 & 0 \\ \hline 1 & 1 & 0 & 1 & 1 \end{array}$$

Number of 1's is 4

$$\begin{array}{ccccc} 0 & 1 & 1 & 0 & 1 \\ 1 & 1 & 0 & 1 & 1 \\ \hline 1 & 0 & 1 & 1 & 0 \end{array}$$

Number of 1's is 3

$$\begin{array}{ccccc} 1 & 0 & 1 & 1 & 0 \\ 1 & 1 & 0 & 1 & 1 \\ \hline 0 & 1 & 1 & 0 & 1 \end{array}$$

Number of 1's is 3

$\therefore$ The minimum distance (d_{min}) is 3

10. (c)

Please refer video solution.