

CS & IT ENGINEERING

Computer Network

Error Control

DPP 01 (Discussion Notes)



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TOPICS TO BE COVERED

01 Question

02 Discussion

Q.1

The Hamming distance between 100 and 001 is ____.

[MCQ]



Hamming distance = 2

☒ A.

2

☐ B.

0

☐ C.

1

☐ D.

None of the above

Q.2

[MCQ]



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. (T)

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

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

Q.3

Which is/are the error detection techniques?

[MCQ]



A.

Check sum

B.

VRC

C.

CRC

☒ D.

All of the above

Q.4

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

[MCQ]



A.

Block words

B.

Code words

C.

Data words

D.

None of these

$K \rightarrow$ data word

$r \rightarrow$ redundant bit

$$\frac{n = k + r}{\swarrow}$$

code word

Q.5

In block coding, if $k=2$ and $n=3$, we have _____ invalid codewords



$$n = k + r$$

[MCQ]

A.

8

B.

4

C.

2

D.

None of the above

$K=2$

Dataword	Code word (Valid)
00	000
01	011
10	101
11	110

Code word = 3 bit

000 ✓
001 X
010 X
011 ✓
100 X
101 ✓
110 ✓
111 X

Valid codeword
 $2^k = 2^2 = 4$

Invalid code word = $2^n - 2^k$
 $= 2^3 - 2^2 = 8 - 4 = 4$

Q.6

A parity check can detect ____.



[MCQ]

- ☒ A. 1-bit error
- ☐ B. 2-bit error
- ☐ C. 8-bit error
- ☐ D. None of these

Q.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_7) and is padded with a column d_8 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.

1011001111010101110111101001100000111000000111

1st row

2nd row

3rd row

4th row

5th row

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

[MCQ]

A.

(r_3, d_6)

☒ B.

(r_2, d_6)

C.

(r_1, d_2)

☐ D.

None of the bit is corrupted

	d_8	d_7	d_6	d_5	d_4	d_3	d_2	d_1	d_0
γ_0	1	0	1	1	0	0	1	1	1
γ_1	1	0	1	0	1	0	1	1	1
γ_2	0	1	1	1	1	0	1	0	0
γ_3	1	1	0	0	0	0	0	1	1
γ_4	1	0	0	0	0	0	1	1	1

even parity

(γ_2, d_6)

Q.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 2+1+0=3

[NAT]

Minimum Hamming distance
required to detect 'd' bit

$$e \leq d$$

$$d+1=2$$

$$d=1$$

y

$$z=0$$

0101111

EX-OR

0101010

0000101

No. of 1's = 2 (x) (Hamming distance)

Q.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

3.

	d_1	d_0	P_2	P_1	P_0
(a)	0	0	0	0	0
(b)	0	1	1	0	1
(c)	1	0	1	1	0
(d)	1	1	0	1	1

$$d(a,b) = 3$$

$$d(a,c) = 3$$

$$d(a,d) = 4$$

$$d(b,c) = 4$$

$$d(b,d) = 3$$

$$d(c,d) = 3$$

minimum Hamming
distance = 3

[NAT]

Q.10

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

[MCQ]



- ☐ A. 2
- ☐ B. 3
- ☒ C. 5
- ☐ D. None of the above

codeword(n) = 5 bit

(1) 00000
00001
00010
00011
⋮
⋮
⋮

(32) 11111

$d(1, 32) = 5$

maximum Hamming
distance = 5

