CS & IT ENGINEERING

Computer Network

Error Control

DPP 01 (Discussion Notes)

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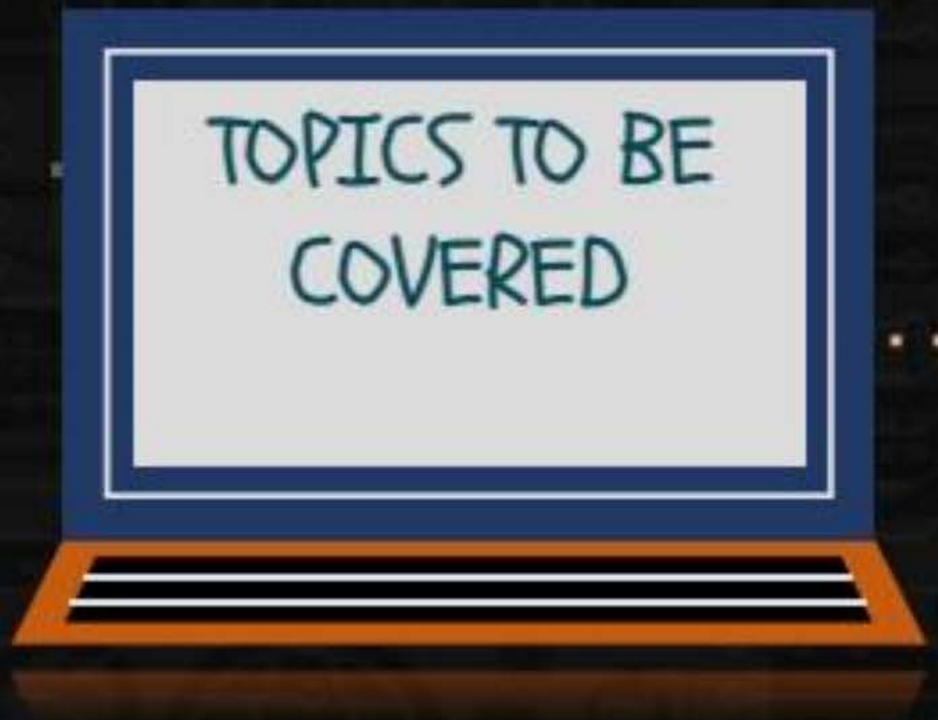


01 Question

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 S2 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 → dataword

r → redundant bit

n = K + r

n → codeword

Q.5 In block coding, if k=2 and n=3, we have _____invalid codewords [MCQ]

$n = k + r$

A. 8

B. 4 ✓

C. 2

D. None of the above

K = 2

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

Codeword = 3 bit

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

Valid codeword

$2^k = 2^2 = 4$

Invalid codeword $= 2^n - 2^k$

$= 2^3 - 2^2 = 8 - 4 = 4$

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 r0 through r_3 and column d_8 through d_1) and is padded with a column do and row r_4 of parity bits computed using the even parity scheme. each bit of column d0 (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.

10110011 10101011 01111010 01100001 10000111

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.

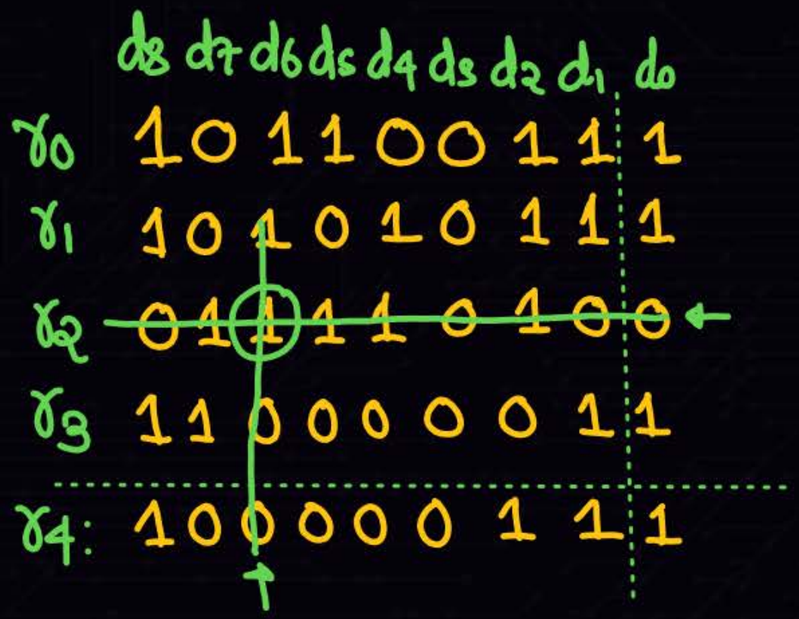
[MCQ]

A. (r_3, d_6)

B. $(r_2\ d_6)$

C. (r_1, d_2)

D. None of the bit is corrupted



even parity

(r_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 error = d+1

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 .

[NAT]

	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

Q.10 In block coding, if n=5, the maximum hamming distance between two codewords is _____. **[MCQ]**

A. 2

B. 3

C. 5 ✓

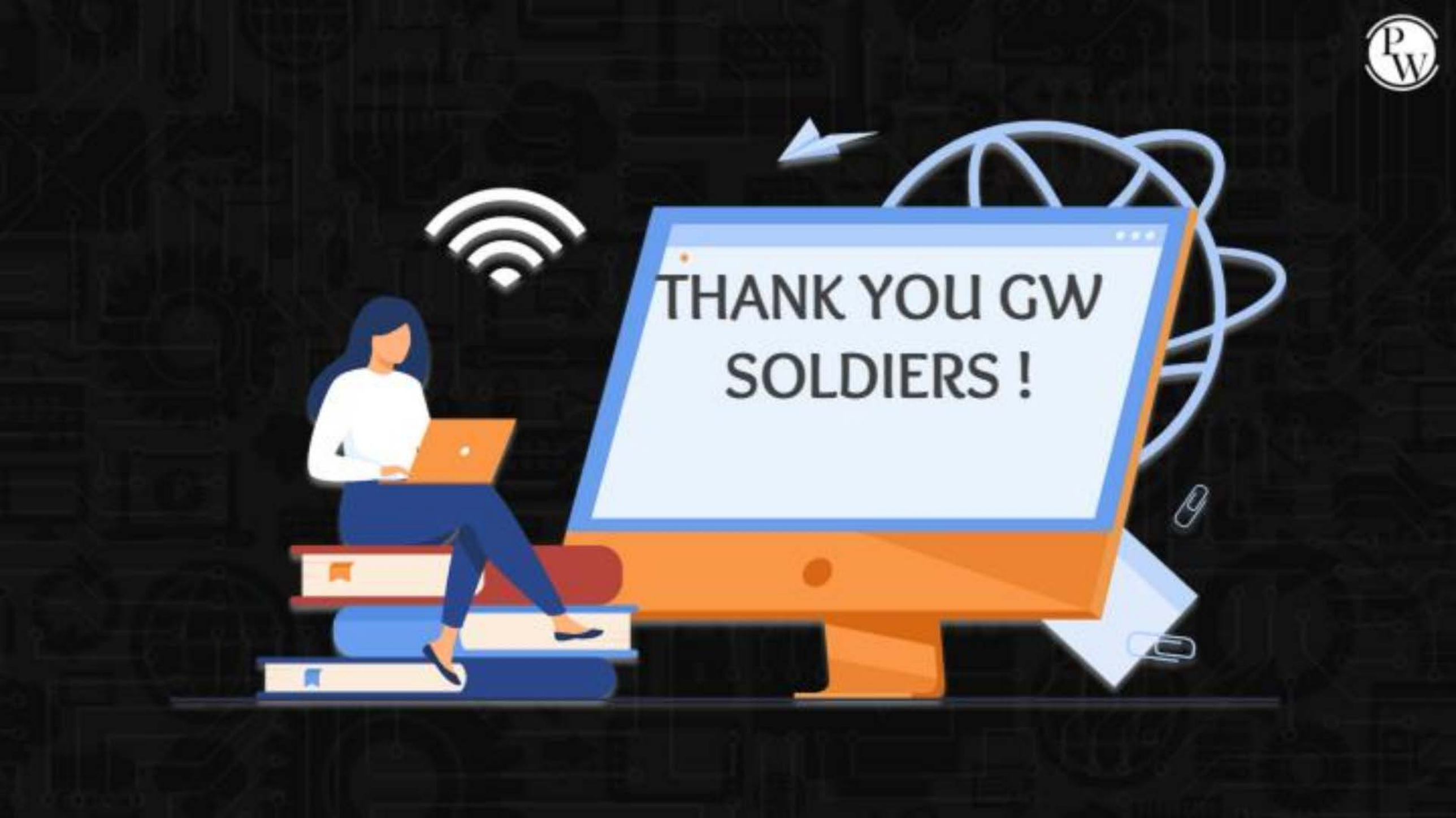
D. None of the above

Codeword (n) = 5 bit

(1) 00000
00001
00010
00011
⋮
(32) 11111

d(1, 32) = 5

maximum Hamming distance = 5


THANK YOU GW
SOLDIERS !