# CSE 320

## Assignment 04

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section : 18

Ans. to the. Q. No - 1

Single bit error means that only one bit of given data unit (such as byte, character or data unit) is changed from 1 to 0 or from 0 to 1. while the term burst error means that two or more bits in data unit have changed from 1 to 0 or 0 to 1.

According to text, k is the no. of bits in the dataword,
n " " " " " " " codeword

Data word, $K = 20$ bits

Code word, $n = 25$ bits

We know,

$n = K + r$ [where $r$ = No of redundant bits]

$\Rightarrow r = n - K$

$= 25 - 20$

$= 5$ bits

$\therefore$ $K = 20$ bits, $n = 25$ bits, $r = 5$ bits

Therefore, 5 redundant bits are added to each data word in this block code. These redundant bits are used to detect and correct errors that may occur during transmission.

Ans. to the Q. No - 2

Given,

Data word $K = 5$ bits

Code word $n = 8$ bits

Then, The no. of 0s need to be added in the dataword to make the dividend $= n - k$

$= 8 - 5$ bits

$= 3$ bits

Size of remainder is same as the number of 0s needed, $r = 3$ bits

size of the divisor $= n - k + 1$

$= 8 - 5 + 1$

$= 4$ bits

Ans. to the Q.No-3

data word = 1010011010 1

divisor = 10101

```
                    10001101001
                    ----------------------
10101 | 10100 11010 1 0 0 0 0
        10101
        -----
        0 0 0 0 1 1 1 0 1
            10101
            ------
            0 1 0 0 0 0
              10101
              ------
              0 0 1 0 1 1 0
                10101
                -------
                0 0 0 1 1 0 0 0
                  10101
                  -------
                  0 1 1 0 1
```

Binary form : 10100110101 0000
(Dividend)

Divisor : 10101

Quotient : 10001101001

Remainder / crc bits : 1101

Sent Data : $\underbrace{10100110101}_{\text{Data word}}\underbrace{1101}_{\text{Remainder}}$
(code word)

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Data word : 10100110101

Dataword
~~Dividend~~ in Polynomial:

$= 1.x^{10} + 0.x^9 + 1.x^8 + 0.x^7 + 0.x^6 +$
$1.x^5 + 1.x^4 + 0.x^3 + 1.x^2 + 0 \times x^1 + 1 \times x^0$

$= x^{10} + x^8 + x^5 + x^4 + x^2 + 1$

Divisor : 10101

Divisor in Polynomial:

$= 1.x^4 + 0.x^3 + 1.x^2 + 0.x^1 + 1.x^0$

$= x^4 + x^2 + 1$

$$
\begin{array}{r|l}
 & x^{10} + x^{6} + x^{5} + x^{3} + 1 \\
\hline
x^{4} + x^{2} + 1 & x^{14} + x^{12} + x^{9} + x^{8} + x^{6} + x^{4} \leftarrow \text{Dividend (Augmented dataword)} \\
 & x^{14} + x^{12} + x^{10} \\
\hline
 & x^{10} + x^{9} + x^{8} + x^{6} \\
 & x^{10} + x^{8} + x^{6} \\
\hline
 & x^{9} + x^{4} \\
 & x^{9} + x^{7} + x^{5} \\
\hline
 & x^{7} + x^{5} + x^{4} \\
 & x^{7} + x^{5} + x^{3} \\
\hline
 & x^{4} + x^{3} \\
 & x^{4} + x^{2} + 1 \\
\hline
 & x^{3} + x^{2} + 1
\end{array}
$$

Data word : $x^{10} + x^{8} + x^{5} + x^{4} + x^{2} + 1$

Dividend (Augmented Dataword) : $x^{14} + x^{12} + x^{9} + x^{8} + x^{6} + x^{4}$

Divisor : $x^{4} + x^{2} + 1$

Quotient : $x^{10} + x^{6} + x^{5} + x^{3} + 1$

Remainder : $x^{3} + x^{2} + 1$

sent data (codeword) : $\underbrace{x^{14} + x^{12} + x^{9} + x^{8} + x^{6} + x^{4}}_{\text{Augmented Dataword}} + \underbrace{x^{3} + x^{2} + 1}_{\text{Remainder}}$

Ans. to. the. Q. No - 4

Sender side:

Hex: 466F 726F 757A 16E

Dec: 18031 29295 30074 366

Binary of,

| | | | | |
|---|---|---|---|---|
| | | 1 | 11 | |
| 18031 : | 0100 | 0110 | 0110 | 1111 |
| 29295 : | 0111 | 0010 | 0110 | 1111 |
| 30074 : | 0111 | 0101 | 0111 | 1010 |
| 366 : | 0000 | 0001 | 0110 | 1110 |
| 77766 : | 1 0010 | 1111 | 1100 | 0110 |
| | | | | +1 |
| | 0010 | 1111 | 1100 | 0111 |
| ∴ Checksum : | 1101 | 0000 | 0011 | 1000 (1's complement) |

Carry

Dec : ~~12248~~ ~~53288~~ 53304

Hex : D038

Receiver side:

| | | | | | |
|---|---|---|---|---|---|
| Hex: | 466F | 726F | 757A | 16E | D038 |
| Dec: | 18031 | 29295 | 30074 | 366 | 53304 |

Binary of,

| | | | | |
|---|---|---|---|---|
| | | 1 | 11 | |
| 18031 : | 0100 | 0110 | 0110 | 1111 |
| 29295 : | 0111 | 0010 | 0110 | 1111 |
| 30074 : | 0111 | 0101 | 0111 | 1010 |
| 366 : | 0000 | 0001 | 0110 | 1110 |
| 53304 : | 1101 | 0000 | 0011 | 1000 |
| 131070 : | 11111 | 1111 | 1111 | 1110 |
| | | | | +1 |
| | 1111 | 1111 | 1111 | 1111 |
| checksum : | 0000 | 0000 | 0000 | 0000 (1s complement) |

carry

There is no error.

Ans. to. the Q. No - 5

(a) Twisting in the twisted - Pair cable allows each wire to have approxi-mately the same noise level and reduces crosstalk. It makes it probable that both wires are equally affected by external influence.

(b) Coaxial cable is used for cable TV, Thin Ethernet, Thick Ethernet.

(c) The inner core of an optical fiber is surrounded by cladding. The core is denser than the cladding, so a beam of light moving through the core is reflected of the cladding instead of

being refracted into it. The purpose of cladding in an optical fiber is to avoid the cross talk during transmission.