CS & IT ENGINEERING

Computer Network

Error Control

DPP - 01 Discussion Notes

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[MCQ]

#Q. Consider ASCII character 'B' (ASCII value = 66) is transmitted by transmitter, but ASCII character 'A' (ASCII value = 65) is received by receiver. Identify the type of error ?

A. ~~No any error~~

B. ~~Single bit error~~

C. Burst Error

D. ~~Data insufficient~~

$\boxed{\text{Ans: C}}$

Transmitted Data = 'B' = 66
= 01000010

Received Data = 'A' = 65
= 01000001

*Two-bit Error
[Multiple bit Error]
→ Burst Error

[NAT]

#Q. Consider ASCII character 'A' (ASCII value = 65) is transmitted by transmitter, but ASCII character 'T' (ASCII value = 84) is received by receiver. Count the number of corrupted bits ?

Transmitted Data = 'A' = 65 = 01000001

Received Data = 'T' = 84 = 01010100

No. of corrupted bits = 3

$\boxed{\text{Ans} = 3}$

[MCQ]

#Q. Let suppose, $\boxed{\text{even parity}}$ is used in single-bit parity error detection technique. If transmitter finds total 91 one's in the data (excluding parity) then what should be parity bit value set by the transmitter ?

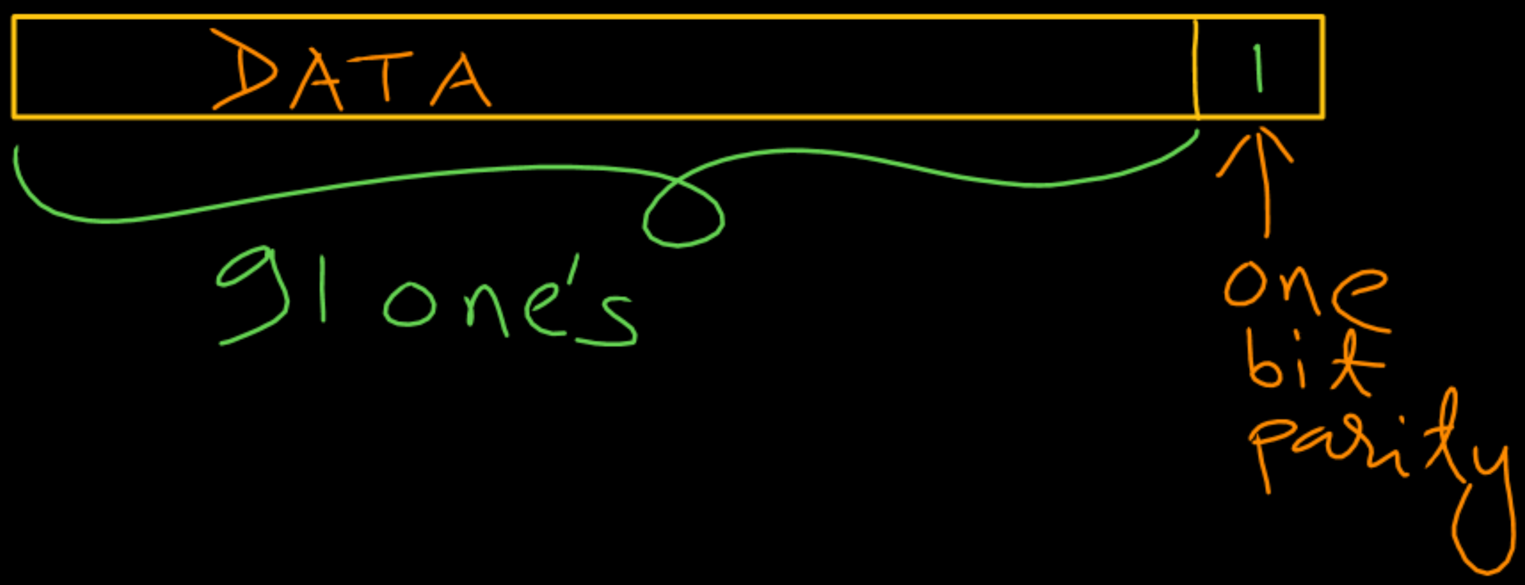
[Even Parity]

A. ~~0~~

B. 1

C. ~~Can be any 0 or 1~~

D. ~~Data insufficient~~



$\boxed{\text{Ans: B}}$

[MCQ]

#Q. Let suppose, even parity is used in single-bit parity error detection technique. If receiver find total 93 one's in the received block (including parity) then what receiver concluded ?

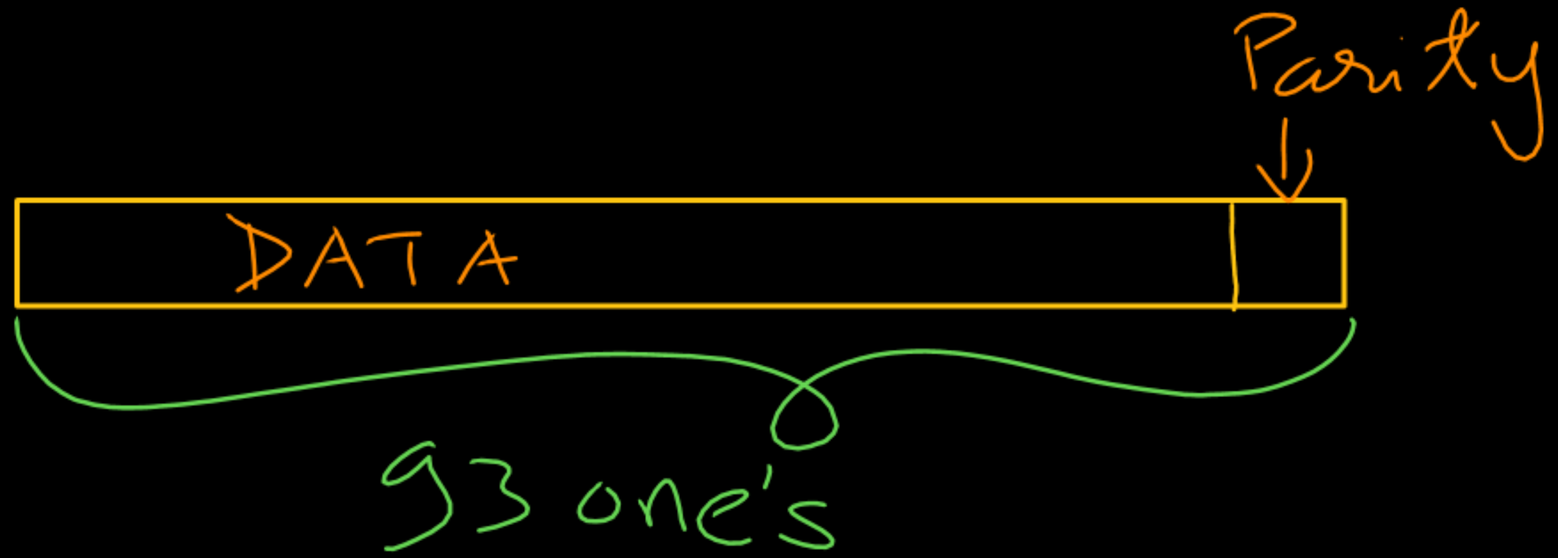
[Even Parity]

A. No any error detected

B. Error detected

C. Unable to detect error

D. Data insufficient

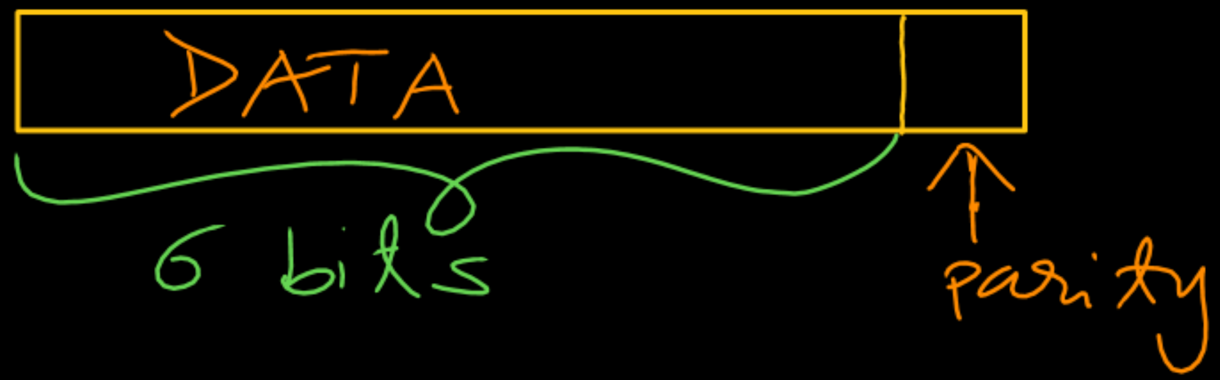


$\Rightarrow$ Error Detected

$\boxed{\text{Ans: B}}$

[NAT]

#Q. Consider single-bit parity error detection technique, the number of data bits are 6 (excluding parity). Count the number of valid code words ?



Single bit parity:-

No. of data bits = 6

No. of valid code words $= 2^6 = 64$

$\boxed{\text{Ans} = 64}$

[MCQ]

#Q. Consider the degree of generator polynomial function is n, what should be length of divisor (in bits) ?

A. n

B. n + 1

C. n – 1

D. 2n

$G(x) = x^n + \dots + 1$

$\text{degree}(G(x)) = n$

$\text{Divisor} = \underbrace{1 \dots\dots 1}_{(n+1) \text{ bits}}$

$\boxed{\text{Ans: B}}$

[MCQ]

#Q. Consider generator polynomial function is $x^3 + 1$, if data is 1011010110 then calculate CRC ?

- **A** 001
- **B** 011
- **C** 101
- **D** 110

$G(x) = x^3 + 1$

Divisor = 1001

```
1001 ) 1011010110000
       1001
       ----------------
          10010110000
          1001
          -------------
              110000
              1001
              ---------
               10100
               1001
               --------
                 110
```

$\underbrace{110}_{\text{CRC}}$

$\boxed{\text{Ans: D}}$

[MCQ]

#Q. Consider generator polynomial function is $x^3 + x + 1$, if received codeword by receiver is 1101011010100 then what receiver concluded ?

A. ~~No any error detected~~

B. Error detected ✓

C. ~~Unable to detect error~~

D. ~~Data insufficient~~

$\boxed{\text{Ans: B}}$

$$
\begin{array}{r}
1011\,\big)\,1101011010100 \\
1011 \\
\hline
110011010100 \\
1011 \\
\hline
11111010100 \\
1011 \\
\hline
1001010100 \\
1011 \\
\hline
10010100 \\
1011 \\
\hline
100100 \\
1011 \\
\hline
1000 \\
1011 \\
\hline
11
\end{array}
$$

$G(x) = x^3 + x + 1$

Divisor = 1011

If receiver finds non-zero remainder after division then receiver concluded "Error Detected"

[MSQ]

#Q. Identify $\boxed{\text{correct}}$ statement(s) regarding CRC error detection technique.

A. CRC can detect any length burst error up-to the degree of generator polynomial function G(X) TRUE

B. If (1 + X) is a factor of generator polynomial function G(X) then CRC can detect all odd number bits error. TRUE

C. If generator polynomial function G(X) does not divide $1 + X^k$, for any k upto frame length then CRC can detect any two bit error. TRUE

D. To ensure correct operation of CRC the generator polynomial function G(X) should not be completely divisible by X. TRUE

$\boxed{\text{Ans: A, B, C \& D}}$

[MCQ]

#Q. Consider error control method has code words with 'd' hamming distance, receiver can detect upto ______ bits errors.

A. d

B. d – 1

C. d + 1

D. d/2

$\boxed{\text{Ans: B}}$

min^m Hamming Distance = d

→ it can detect upto (d-1) bits error

→ it can correct upto $\left\lfloor \frac{(d-1)}{2} \right\rfloor$ bits error

[NAT]

#Q. To correct upto 5 bits error minimum hamming distance should be ______ .

To detect x bits error

$\rightarrow$ Min^m H.D. should be $(x+1)$.

To correct y bits error

$\rightarrow$ Min^m H.D. should be $(2y+1)$

$$\boxed{\begin{aligned} Ans &= (2*5+1) \\ &= 11 \end{aligned}}$$

[NAT]

#Q. Consider an error control method has the following code words :

c_1 c_2 c_3 c_4

00000000, 00001111, 11110000, 11111111

What is maximum number of bit errors that can be corrected ?

$\min^m$ Hamming Distance $(d) = \min[d(c_1, c_2), d(c_1, c_3), d(c_1, c_4), d(c_2, c_3), d(c_2, c_4), d(c_3, c_4)]$

$= \min[4, 4, 8, 8, 4, 4]$

$d = 4$

Max^m no. of bits error that can be corrected $= \left\lfloor \frac{(d-1)}{2} \right\rfloor = \left\lfloor \frac{(4-1)}{2} \right\rfloor = 1$

$\boxed{\text{Ans} = 1}$

THANK - YOU