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22) Illustrate various types of transmission errors with example.

Single bit error - In a received frame only one bit has been corrupted i.e either changed from 0 to 1 or from 1 to 0 and rest all the bits are received correctly

Ex:- Suppose the data frame 1111 is sent over the transmi-ssion line and at the receiver end the data frame is received as 1011. The second bit is changed from 1 to 0.

Burst error - In a received frame, more than one consecutive bits are corrupted.

Ex:- Suppose data sent is 1111 received 0001. Three bits are changed from 1 to 0.

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23) Illustrate the process of error detection using Block coding with the help of a neat diagram

→ Block coding is a technique used to detect errors in digital data transmissions. In this method, a block data is divided into smaller blocks, and each block is encoded with redundant bits to detect and correct errors during transmission.

Here is a simple diagram to illustrate the process of error detection using block coding

Original data block : 11010101

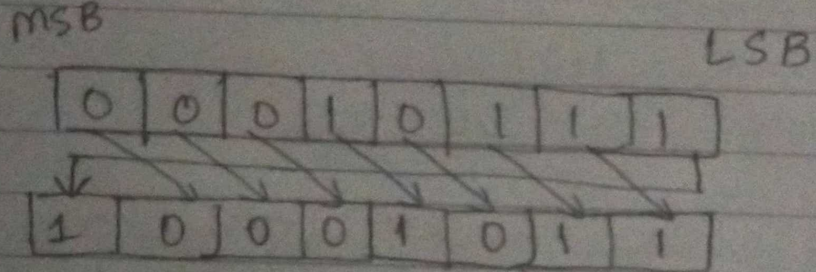
Encoded data block : 1101 0101 011

Redundant bits : 011

In the above example, we have a block of data with eight bits '11010101'. We divide this into small blocks called code words we have divided into four bit code words '1101' and '0101'. Next, we add redundant bits to each code word. These redundant bits are used to detect and correct errors during transmission. In this example we have added two redundant bits to the first code word and one redundant bit to the second code word. Finally we transmit the encoded data block over the communication channel. If there are no errors during transmission the receiver can decode the data block and receive the original data. If there are errors the redundant bits can be used to detect the errors and correct them.

24) write a short notes on cyclic codes

A cyclic code is a block code, where the circular shifts of each codeword gives another word that belongs to the code. They are error-correcting codes that have algebraic properties that are convinient for efficient error detection and correction.



If 00010111 is a valid codeword, applying right circular shift gives the string 10001011. If the code is cyclic then 10001011 is again a valid codeword. In general, applying a right ~~shift~~ circular shift moves the LSB to the leftmost position, so that it becomes MSB. The other positions are shifted by 1 to the right.

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25) Dataword = 11011101

Divisor = 10100

Add 4 zeros to dataword

110111010000 = Frame

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```
             11100100
10100 ) 110111010000
        10100↓
        X11111
         10100↓
         X10110
          10100↓
          X00101
           00000↓
           X01010
            00000↓
            X10100
             10100↓
             X00000
              00000↓
              X00000
               00000
               X0000
```

∴ If the remainder is 0, then the data received is perfect. there is no data loss occured.

_/_/_

• Convert the following into equivalent Binary format.

a) 192.168.10.23.

2 | 192	2 | 168	2 | 10	2 | 23
2 | 96 - 0	2 | 84 - 0	2 | 5 - 0	2 | 11 - 1
2 | 48 - 0	2 | 42 - 0	2 | 2 - 1	2 | 5 - 1
2 | 24 - 0	2 | 21 - 0	1 - 0	2 | 2 - 1
2 | 12 - 0	2 | 10 - 1		1 - 0
2 | 6 - 0	2 | 5 - 0		
2 | 3 - 0	2 | 2 - 1		
1 - 1	1 - 0		
11000000	= 10101000	= 00001010	= 00010111

b) 168.239.0.10

2 | 168	2 | 239	0	2 | 10
2 | 84 - 0	2 | 119 - 1		2 | 5 - 0
2 | 42 - 0	2 | 59 - 1		2 | 2 - 1
2 | 21 - 0	2 | 29 - 1		1 - 0
2 | 10 - 1	2 | 14 - 1		
2 | 5 - 0	2 | 7 - 0		
2 | 2 - 1	2 | 3 - 1		
1 - 0	1 - 1		
= 10101000	= 11101111	= 0 ⇒ $\boxed{00000000}$	= 00001010

• Binary IP address into equivalent decimal format.

(a) 01111000 10000011 11001100

• 0 1 1 1 1 0 0 0	• 1 0 0 0 0 0 1 1	• 1 1 0 0 1 1 0 0
$= 1\times2^3 + 1\times2^4 + 1\times2^5 + 1\times2^6$	$= 1\times2^0 + 1\times2^1 + 1\times2^7$	$= 1\times2^2 + 1\times2^3 + 1\times2^6 + 1\times2^7$
$= 8 + 16 + 32 + 64$	$= 1 + 2 + 128$	$= 4 + 8 + 64 + 128$
$= 120$	$= 131$	$= 204$

$\therefore \Rightarrow 120.131.204$

(b) 11011000 00001111 10101010

• 1 1 0 1 1 0 0 0	• 0 0 0 0 1 1 1 1	• 1 0 1 0 1 0 1 0
$= 1\times2^3 + 1\times2^4 + 1\times2^6 + 1\times2^7$	$= 1\times2^0 + 1\times2^1 + 1\times2^2 + 1\times2^3$	$= 1\times2^1 + 1\times2^3 + 1\times2^5 + 1\times2^7$
$= 8 + 16 + 64 + 128$	$= 1 + 2 + 4 + 8$	$= 2 + 8 + 32 + 128$
$= 216$	$= 15$	$= 170$

$\Rightarrow 216.15.170$

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32)

a) 168.04.56.27

error

There should be no unwanted zeros

b) 257.127.4.67

error, should be 0 to 255

c) $\underbrace{168.33.25.2}_{32\text{ bits}}$.1 This is extra

error, should 32 bits

d) 100.25.4.67

No error.