COMPUTER NETWORKS

ASSIGNMENT NO-03

COURSE: T.E. **Year : 2020-2021** **Semester: V**

DEPT: Computer Engineering

FACULTY: Umesh Mantale **DUE DATE: 04/09/2020**

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Class: TE-Comps B **Date of Submission:** 15/08/2020

Questions:

Solve the following

1. Consider your Roll No and add 128 to it and then convert it to binary.
2. Consider your name, take the first 4 characters and convert them to ASCII code.
3. Consider the output obtained from Q.1 to assume that the 5th bit is corrupted, using a single parity check detect it.
4. Consider the ASCII code obtained from Q.2 to use 2-dimensional parity checks to obtain the parity bit.
5. Consider the ASCII code obtained from Q.2 to calculate the checksum and at the receiver end check it at the receiver end.
6. Consider output obtained from Q.1 to use 1010 to divide it using modulo-2, obtain CRC code then send it to receiver, show the operations carried out by receiver for its genuineness.
7. Use the output of Q.1 to corrupt the 5th bit and detect it using Hamming code method.

Q.1.

Ans:

Roll number: 50

Add : 128

178

Convert it to Binary

Step 1: Divide $(178)_{10}$ successively by 2 until the quotient is zero.

2	178	
2	89	0
2	44	1
2	22	0
2	11	0
2	5	1
2	2	1
2	1	0
	0	1

↑ LSB

MSB

Step 2: Read from the bottom (MSB) to top (LSB)

$$(178)_{10} = (10110010)_2$$

Q.2.

Ans:

Name : AMEY

Convert to ASCII.

Letter	Decimal	Binary						
		64	32	16	8	4	2	1
A	65	1	0	0	0	0	0	1
m	77	1	0	0	1	1	0	1
E	69	1	0	0	0	1	0	1
y	89	1	0	1	1	0	0	1

AMEY = $(65\ 77\ 69\ 89)_{10}$

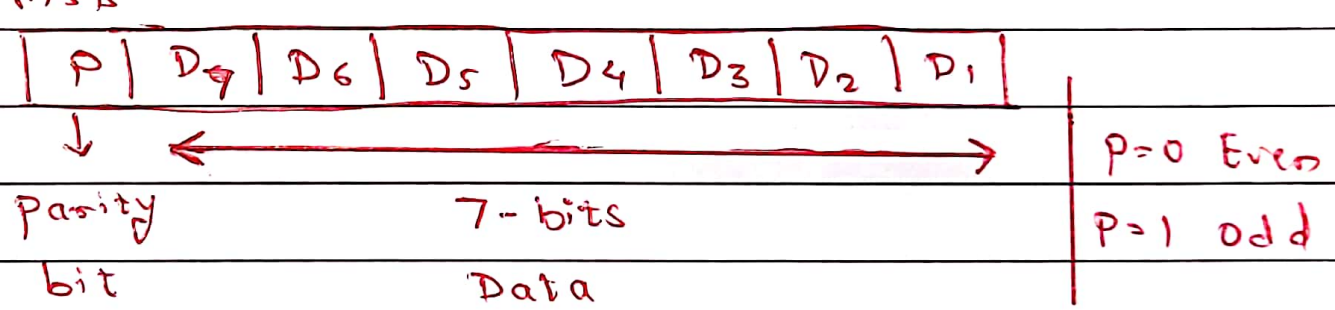
= $(1000001\ 1001101\ 1000101\ 1011001)_2$

Q.3.

Ans:

Single Parity Check

- The MSB of an 8-bit word is used as parity bit and remaining 7 bits are used as data of message bits



Sender's side ⇒ P=1 (odd)

1	0	1	1	0	0	1	0

Receiver's side ⇒

1	0	1	0	0	0	1	0

Since, Parity bit is 1, so number of 1's should be odd

Received code with error,

5th bit is changed from 1 to 0.

Q.4.

Ans:

Code Word : (1000001 1001101 1000101 1011001)

Two Dimentional Parity checking

VRC → Each Character Block

LRC → Entire Block of codes

Original ⇒ 1000001 1001101 1000101 1011001

								Row Parity
	1	0	0	0	0	0	1	0
	1	0	0	1	1	0	1	0
	1	0	0	0	1	0	1	1
	1	0	1	1	0	0	1	0
Column Parity	0	0	1	0	0	0	0	1

Transmitted :

⇒ 10000010 10011010 10001011 10110010 00100001

Q.5.

Ans:

Frames to share

1000001, 1001101, 1000101, 1011001

Sender's End

⇒ [Checksum Error Detection]

```
        1 0 0 0 0 0 1
        1 0 0 1 1 0 1
        1 0 0 0 1 0 1
Carry   1 0 1 1 0 0 1
  10  | 0 1 0 0 1 0 0      } Addition of carry
                    1 0
        0 1 0 0 1 1 0
Checksum: 1 0 1 1 0 0 1    1's complement
```

Append checksum to the message

⇒ 1011001 1000001 1001101 1000101 1011001

Receiver's End

⇒

```
        1 0 1 1 0 0 1
        1 0 0 0 0 0 1
        1 0 0 1 1 0 1
        1 0 0 0 1 0 1
Carry   1 0 1 1 0 0 1
  10  | 1 1 1 1 1 0 1      } Addition of Carry
                    1 0
        1 1 1 1 1 1 1
        0 0 0 0 0 0 0      1's complement
```

The result is complemented and found to be Zero. Hence, receiver assumes that no error has occured.

Q.6.

Ans:

Data word to be sent - 10110010

Key - 1010

[Cyclic Redundancy Check and Modulo-2 Division]

Sender's side

```
            10010111
      1010 | 10110010000
             1010
             00010010000
              0000
              0100100000
              0000
               10010000
               1010
               00110000
                0000
                 110000
                 1010
                 011000
                  1010
                  01100
                   1010
                  [0110]
```

Therefore, the remainder is 110

Hence, the encoded data sent is 10110010110

Receiver's side

⇒

Code word received at the receiver side

⇒ 1011001011 0

```
            1001011 1000
1010 ) 1011001011 0000
       1010
       0001001011 0000
          0000
           01001011 00000
            0000
             1001011 0000
             1010
              0011011 0000
               0000
                11011 0000
                1010
                 0111 10000
                  1010
                   01010000
                    1010
                     00000000
                      0000
                       00000
                        0000
                         0000
                          0000
                           000
```

Therefore, the remainder is all zeros.

Hence, data received has no error.

Q.7.

Ans:

Code Word : 10110010

Type of parity : Even

[Hamming code method]

1	0	1	1		0	0	1		0		
D_{12}	D_{11}	D_{10}	D_9	P_8	D_7	D_6	D_5	P_4	D_3	P_2	P_1

For $P_1 \Rightarrow$ P_1 D_3 D_5 D_7 D_9 D_{11}

P_1 0 1 0 1 0 $\Rightarrow$ 0 $\quad$ $P_1 = 0$

For $P_2 \Rightarrow$ P_2 D_3 D_6 D_7 D_{10} D_{11}

P_2 0 0 0 1 0 $\Rightarrow$ 1 $\quad$ $P_2 = 1$

For $P_4 \Rightarrow$ P_4 D_5 D_6 D_7 D_{12}

P_4 1 0 0 1 $\Rightarrow$ 0 $\quad$ $P_4 = 0$

For $P_8 \Rightarrow$ P_8 D_9 D_{10} D_{11} D_{12}

P_8 1 1 0 1 $\Rightarrow$ 1 $\quad$ $P_8 = 1$

Transferred Data :

$\Rightarrow$

1	0	1	1	1	0	0	1	0	0	1	0

Suppose the 5th bit changed from 1 to 0 during data transmission, then it gives new parity values in the binary

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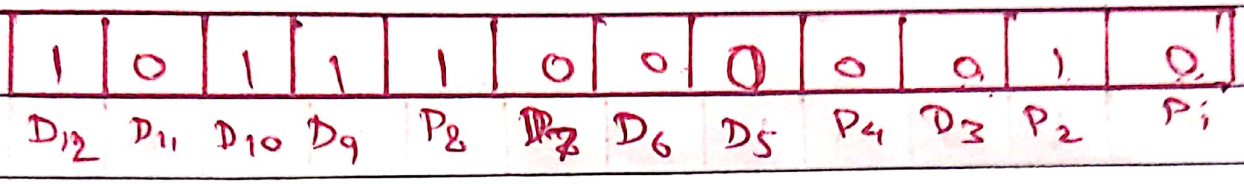


For $P_1 \Rightarrow P_1\ D_3\ D_5\ D_7\ D_9\ D_{11}$

0 0 0 0 1 0 $\Rightarrow$ 1

For $P_2 \Rightarrow P_2\ D_3\ D_6\ D_7\ D_{10}\ D_{11}$

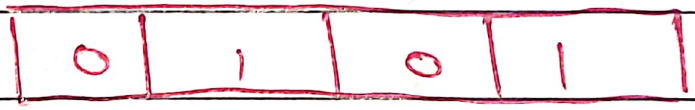
1 0 0 0 1 0 $\Rightarrow$ 0

For $P_4 \Rightarrow P_4\ D_5\ D_6\ D_7\ D_{12}$

0 0 0 0 1 $\Rightarrow$ 1

For $P_8 \Rightarrow P_8\ D_9\ D_{10}\ D_{11}\ D_{12}$

1 1 1 0 1 $\Rightarrow$ 0

Error = 

$= 4 + 1$

$= 5$

$\therefore$ Error is at location 5

The correct code is 1011100100010