Toby Nguyen

Quiz 3 Layer 2 - 2221

Question 1

Determine the Hamming code and the resulting transmitted message for

M = 101011001

Show if BIT 5 is flipped, that it will be detected as such at the receiver. Insert the Hamming bits starting from the LEFT in every other position.

Question 2

Create two (2) conversations, each between 2 hosts, to illustrate GO-BACK-N ARQ flow control protocol scenarios.

- One Scenario is error free
- The second scenario deals with CRC detection caused by a transmission error

You should include a brief written explanation so it is clear what you are indicating in your scenarios. Use a 3-bit window size.

Question 3

- Use the CRC method to determine the Frame Check Sequence (FCS) for the following message and polynomial
  - M = 11011101
  - P = 11001

---

1. $2^n \geq m+n+1$ $\quad n=4 \quad 16 \geq 15$

30 $2^n \geq 10+n+1$

M = 101011001

13 12 11 10 9 8 7 6 5 4 3 2 1

H I H O H I H O I I O O I

0001 (1)
0100 (4)
0101
0101 (5)
0000
1000 (8)
1000

1000
1100 (12)
0100 HC

bits flipped

0100
0001 (1)
0101
0100 (4)
0001
1000 (8)
1001

1001
1101 (12)
0101 ⇒ bit 5

Question 2

N(S)	0	1	2	3	4	5	6	7	A	C
N(R)	0	0	1	2	2	2	2	2	B	D

N(S)	0	1	X
N(r)	2	3	Y

Condition 1

X = 2

Y = 0

because after it goes to 7 which is frame 2, It will roll back and go to fram 0 and start couting again with out any errors

Condition 2 fram 5 is received error

X = 2

Y = 5

because fram 5 received an error that is why it send a frame 2(X) ask for fram 5(Y) again.

A = 5

B = 3

C = 6

D = 3

30 Question 3

$M = 11011101$

$P = 11001$

$M(x) = x^7 + x^6 + x^4 + x^3 + x^2 + 1$

$P(x) = x^4 + x^3 + 1$

$M'(x) = x^{11} + x^{10} + x^8 + x^7 + x^6 + x^4$

$$
\begin{array}{r|l}
 & x^7 + x^4 + x^3 \\
\hline
x^4 + x^3 + 1 & x^{11} + x^{10} + x^8 + x^7 + x^6 + x^4 \\
 & x^{11} + x^{10} + x^7 \\
\hline
 & x^8 + x^6 + x^4 \\
 & x^8 + x^7 + x^4 \\
\hline
 & x^7 + x^6 \\
 & x^7 + x^6 + x^2 \\
\hline
 & x^3 \\
 & \boxed{\text{FCS}}
\end{array}
$$

$$
\begin{array}{r|l}
 & x^7 + x^4 + x^3 \\
\hline
x^4 + x^3 + 1 & x^{11} + x^{10} + x^8 + x^7 + x^6 + x^4 + x^3 \\
 & \overline{\text{FCS}} \\
 & x^{11} + x^{10} + x^7 \\
\hline
 & x^8 + x^6 + x^4 + x^3
\end{array}
$$

$$\begin{array}{r} x^8 + x^7 + x^4 + x^3 \\ \hline x^7 + x^6 + x^3 \\ x^7 + x^6 + x^3 \\ \hline 0 \quad \checkmark \end{array}$$