EE450: Midterm Solutions

1. T, T, F, F, T, F, T, T, T, F, F, T, F, T, F, F, T, T, T, T, T, T, F, F, T

2. 60Km, 14.3%, 910Hz, 011**0**011**0**1011**0**01, 20Ksec, 2Gbps, 42bits, 105Kbps, 2.5K frames/sec, 19μsec/slot, 37.5Kbps, 9bits, 200Kbps, 49.7Kbps, 2.008sec, 1.508sec, 1.258sec, 1.508sec, 4-Sockets, 9-Sockets

3.

a. Transmitted pattern: 110101**0000**. The red bits are the FCS bits

b. Received Pattern 0001111001. Five errors did occur (Since the received Pattern is NOT the same as the Transmitted Pattern). Receiver will divide this pattern by the generator pattern and observe a zero remainder. The receiver was **NOT** able to detect the error. According to the receiver, the transmitted sequence was indeed 1101010000 and hence he will decode the message sequence as 000111. Of course, he is wrong.

c. Received pattern = 1101010000 $\oplus$ 1010101010 = 0111111010. When we divide this pattern by the generator pattern, the reminder is 1101 which is **NOT** 0 and hence the receiver is able to detect the error (The receiver does not know how many errors or where are they located). Note the receiver does **NOT** know the error pattern. He only observes the received pattern.

4.

Throughput = 5000/10 = 500 bps

Link Utilization = 5/10 = 50%

Time	Action @ Transmitter	Action @ Receiver	Time
0	Fo is transmitted		0
0.5			0.5
1	F1 is transmitted		1
1.5		Fo is received (No errors)	1.5
2	F2 is transmitted		2
2.5		F1 is received. ACK2 is sent	2.5
3	F3 is transmitted, ACK2 is received		3
3.5		F2 is received and detected to be in error. Receiver drop the frame	3.5
4	F4 is transmitted. This frame is lost		4
4.5		F3 is received but dropped (out of sequence). ACK2 is sent	4.5
5	F2 is timed out and is retransmitted. ACK2 is received		5
5.5			5.5
6	F3 is transmitted		6
6.5		F2 is received (No errors)	6.5
7	F4 is transmitted		7
7.5		F3 is received. ACK4 is sent	7.5
8	ACK4 is received		8
8.5		F4 is received (No errors)	8.5
9			9
9.5		ACK5 is sent	9.5
10	ACK5 is received. End of Transmission		10

5.

Step	Action	Delay (sec)
1	Client A request the IP address of X from local DNS server	0
2	Local DNS server contact the RNS for IP address of X. The RNS server return the IP address of the TLD.	0.5 (Round Trip)
3	Local DNS server contact the TLD for IP address of X. The TLD server return the IP address of the Authoritative name server.	0.5 (Round Trip)
4	Local DNS server contact the Authoritative name server for IP address of X. The Authoritative name server return the IP address of the webserver X.	0.2 (Round Trip)
5	The Local DNS server returns the IP address of X to the client DNS which in turn passes it to HTTP	0
6	Client A requests setting up a TCP connection with the server X (Handshaking)	0.2 (Round Trip)
7	Client A request downloading the HTML page	0.1
8	Page downloaded	(1G/1G) + (1G/100M) + (1G/1G) + 0.1 = 12.1
9	**Total Delay**	**13.6 seconds**