EE450 : Midterm Solutions

1. T, F, F, T, F, F, T, T, F, F, T, T, F, F, T, F, T, F, F, T, F, T, F, F, T, F, T, T, T, F
2. 57.2Kbps, 59KHz, 101111100111111010, 20Ksec, 2Gbps, 93bits, 1550Kbps, 0.06msec, 517Kbps, 382.5Kbps, 10bits, 11 bits, 2(x+y), 90msec, 50msec, 15msec, 20msec, 3 Sockets, 8 Sockets (3 Parents, 5 Childs), 7 Networks
3.
   a. 4 FCS bits, 1110, Transmitted pattern: 1101101**1110**. The red bits are the FCS bits.
   b. Received Sequence 00101101111. Seven errors did occur (Since the received sequence is NOT the same as the Transmitted Sequence). The receiver will divide this sequence by the generator pattern and observe a non-zero remainder (0101). **The receiver was able to detect the error**. The receiver drops the frame. The receiver was right in his decision.
   c. Received Sequence = 1101101**1110** $\oplus$ 01100111001 = 10111100111. When we divide this Sequence by the generator pattern, the reminder is 0000. The receiver "failed" to detect the error and will accept the frame. The decoded message according to the receiver is 1011110. Of course, he was wrong in his decision.

4.

Time	Sender Window	Sender Actions	Receiver Actions	Receiver Window	Frames delivered	Time
0	[0, 2]	F_0 is transmitted		[0,2]		0
1		F_1 is transmitted (Lost)				1
1.5			F_0 is received, A_0 is transmitted	[1, 3]	F_0 is delivered	1.5
2	[1, 3]	A_0 is received. F_2 is transmitted				2
3		F_3 is transmitted (Lost)				3
3.5			F_2 is received, A_2 is transmitted (Lost)			3.5
4		F_1 is timed-out and retransmitted				4
5		F_2 is timed-out and retransmitted				5
5.5			F_1 is received, A_1 is transmitted	[3, 5]	F_1 and F_2 are delivered.	5.5
6	[2, 4]	F_3 is timed out and is re-transmitted, A_1 is received				6
6.5			F_2 is received and dropped, A_2 is re-transmitted			6.5
7	[3, 5]	A_2 is received. F_4 is transmitted				7
7.5			F_3 is received, A_3 is transmitted.	{4, 6}	F_3 is delivered	7.5
8	[4, 6]	A_3 is received. F_5 is transmitted				8
8.5			F_4 is received, A_4 is transmitted and lost	[5, 7]	F_4 delivered	8.5
9.5			F_5 is received, A_5 is transmitted.	[6, 0]	F_5 is delivered	9.5
10		F_4 is timed out and is re-transmitted, A_5 is received				10
11.5			F_4 is received and dropped, A_4 is re-transmitted			11.5
12	[6,0]	A_4 is received				12

Throughput = 6000/12 = 500 bps

Link Utilization = 6/12 = 50%

5.

a.

Step	Action	Delay (sec)
1	Client A requests the IP address of the webserver X from local DNS server	0
2	Local DNS server contacts the RNS for IP address of X. The RNS server return the IP address of the TLD.	1 (Round Trip)
3	Local DNS server contacts the TLD for IP address of X. The TLD server returns the IP address of the Authoritative name server of X	1 (Round Trip)
5	The Local DNS server contacts the Authoritative name server of X and get the IP address of X	0.2 (Round Trip)
6	The Local DNS caches the IP address and return it to client.	0
7	Client requests the HTTP proxy Server to set up a TCP connection with the web server X	0
8	The HTTP Proxy server, acting as a client on behalf of Client A, establish the TCP connection (Handshaking) with the web server	0.2 (Round Trip)
7	The HTTP Proxy requests downloading the HTML file from thew Web server X	0.1
8	The HTML file is downloaded to the HTTP Proxy (He will cache it)	(100M/1G) + (100M/10M) + (100M/1G) + 0.1 = 10.3
9	HTML Proxy (acting as a Server) download the file to Client A)	100M/1G = 0.1
10	**Total Delay**	**12.9 sec**

b. It will take host B only **0.1 sec** to get the HTML file downloaded because of the caches in both the local DNS server and the local HTTP Proxy (Both on the same LAN)

c. The end-to-end throughput for Client A ~ **10Mbps** (The Bottleneck) whereas the end-to-end throughput of Client B is **1 Gbps**.

d. Since it takes 10sec to send the file from R_2 to R_1, the maximum rate at which requests to send the file from X to any client in LAN1 is 1 request every 10sec or an arrival rate of 0.1requests/sec.