

EE450: Midterm Solutions

Fall 2020

1. F, T, F, F, F, F, T, T, T, T, F, F, F, F, F, T, T, F, F, F, T, d, (a, b, c, d), (b, d)
2. 60Km, 14.3%, 640 Hz, 010111111011011110101, 800sec, 80sec, 14 slots, 14Kbps, 500 frames/sec, 73.3Kbps, 250Kbps, 9.004msec, 221Kbps, 2.2sec, 2sec, 1.85sec, 2sec, 2 sockets (UDP), 7 sockets (TCP)
3.
 - a. Transmitted pattern: 101011**010**. The red bits are the FCS bits
 - b. Received Pattern 010010111. Errors did occur (Since the received Pattern is NOT the same as the Transmitted Pattern). The **number of bits in error is 6**. Receiver will divide the received sequence by the generator sequence and observe a zero remainder. **The receiver failed to detect the error**. The receiver will decide the message was **010010** (of course he is in error)
 - c. Received pattern: 101011010 \oplus 100010111 = 001001101. When we divide this sequence by the generator sequence, the reminder is 011 and hence the error is detected. Note the **receiver does NOT know the error pattern**. He only observes the received pattern.
5.
 - a. There are 5 Networks (1 LAN and 4 WAN)
 - b. Transmission Time of file over LAN = 1Gbit/1Gbps = 1 sec
Transmission Time of file over WAN link = 1Gbit/100Mbps = 10 sec

Step	Action	Delay (sec)
1	Host A contact Local DNS server inquiring about IP address of H	0
2	Local DNS contact the root name server E	0.2
3	Local DNS contact the TLD Server F	0.2
4	Local DNS contact the Authoritative Server I	0.2
5	Local DNS Server return the IP address of Server H to Client A	0
6	Client A establish TCP Connection with Sever H (handshaking)	0.2
7	Client A request downloading the document	0.1
8	Document downloaded over WAN link (Transmission + Propagation)	10.1
9	Document downloaded over LAN link (Transmission ONLY)	1
9	Total Delay	12 sec

4. **The color codes are** Black (Frames received with no errors detected), Red (Frame retransmitted due to expiration of time out), Green (Acks, sent every other frame), Star (frame received in error), Blue (Frame lost). Each time division is 0.5 sec (one-way propagation delay). It will take 11 seconds for "A" to finish transmitting all 5 frames and receive ACKs for all of them. Hence, the throughput is 5frames/11 sec. If each frame is 1000 bits long, then the throughput is 454.5 bps bits/sec. The link utilization is therefore ~ 45.5%. Timing diagram is shown below.

