

Midterm



You started this quiz near when it was due, so you won't have the full amount of time to take the quiz.



⚠ This is a preview of the published version of the quiz

Started: Mar 1 at 11:51am

Quiz Instructions

Here are midterm1 questions. You will need Lockdown browser and a webcam to take the exam. Upon finish, you MUST scan and upload your answer sheet (in a single PDF file) to the "Midterm 1 File submission" tab in the "Assignment".

Don't upload any file while taking the exam, though each exam question asks your file submission.

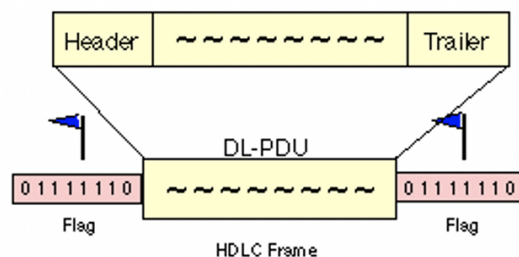
Question 1

0 pts

Suppose a link layer frame has a header **H = 10011** and a payload **M = 1110110**. It is to be transmitted from node A to node B using CRC coding. The CRC generator polynomial is $G(x) = x^3 + x + 1$

a) (3 pts) What is the generated CRC code? (Hint: Error detection algorithm only applies to the payload.)

b) (3 pts) Suppose only CRC code is added to the frame as the tail (**T**) and now we have the frame as **H+M+T** (i.e., DL-PDU in the following figure). If we use HDLC protocol to transmit it, what is the transmitted code? (Hint: remember the bit-stuffing.)



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Question 2

0 pts

Answer the following short answer questions.

a) **(2 pts)** What is the name of 3rd layer in the OSI model? (Hint: counting from bottom)

b) **(2 pts)** What are the 2 problems of the Non-Return to Zero (NRZ) encoding?

c) **(2 pts)** Explain why CSMA/CD cannot be used in wireless environment?

d) **(5 pts)** In the following 2 dimensional parity problem, 6 bit words are used. If odd parity is being used, fill in the missing bit values with a 1 or 0. If it is not possible to correctly determine the bit, put a ? in the box.

0	0		0	0	0
1		1	1	0	0
	1	0	0		0
1	0	0	1	0	
1	0	1	1	1	*

e) **(2 pts)** Suppose a sliding window algorithm is implemented using a SWS=4 and a RWS = 3, will 6 sequence numbers (i.e. 0, 1, 2, 3, 4, 5) be sufficient to correctly distinguish all packets that are received? Explain your answer.

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Question 3

0 pts

A **hypothetical network** has an end to end length of 5000 meters with a propagation speed of 2.5×10^8 m/s. The bandwidth of the link is 40 Mbps (40,000,000 bps). The maximum frame size for transmission on this network is 2400 bits.

a) **(2 pts)** What is the transmission time for a maximum sized frame on the network?

b) **(2 pts)** What is the **one-way** (from one end to the other) propagation delay for the network?

c) **(2 pts)** How long does it take to transmit a maximum sized frame from one end of the network to the other? (This time is the time from when the first bit is transmitted to the last bit received)

d) **(3 pts)** For this network, is the maximum frame size sufficient for CSMA/CD? Explain

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Ques

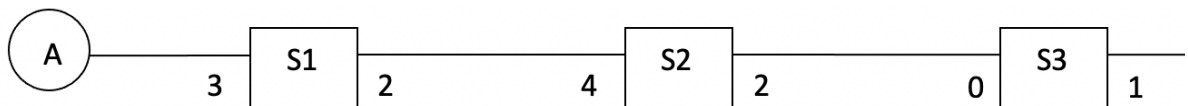


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0 pts

(10 pts) Consider the following virtual circuit network and the table showing the next Virtual Circuit Identifier (VCI) to use for each interface. The outgoing and incoming VCI's can be the same for a given interface/port (i.e. interface 3 on a switch can have a VCI of 5 for incoming packets and a VCI of 5 for outgoing packets). An interface is the same as port, and only the interfaces of interest for each switch are shown (i.e. interfaces 2 and 4 on switch 2).



Note: the network does not show all of the interfaces available on all switches, and it does not show all of the other nodes in the network. Lastly, each interface has its own set of virtual circuit identifiers (i.e each interface on a switch has its own VCI's 0, 1, 2, etc.)

The next VCI to use for interfaces on the switches

Switch	Outgoing Interface	Next VCI to Use
S1	2	1
S1	3	2
S2	2	8
S2	4	5
S3	0	2
S3	1	3

Host A starts a connection to Host Z by sending a **setup message**. A short while later (after connection from A to Z has been established), Host Z starts a connection with Host A by sending a setup message. Use the table above to complete the switch tables below **to show the new entries created** during these virtual circuit setups. Assume that all previous connections remain active during the setups. **Host A uses VCI = 4 for its transmitted frame while Host Z uses VCI = 7.**

Virtual Circuit Table for Switch 1 (S1)

Setup message creating entry	Incoming Interface	Incoming VCI	Outgoing Interface	Outgoing VCI
Z to A				

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Virtual Circuit Table for Switch 2 (S2)

Setup message creating entry	Incoming Interface	Incoming VCI	Outgoing Interface	Outgoing VCI
A to Z				
Z to A				

Virtual Circuit Table for Switch 3 (S3)

Setup message creating entry	Incoming Interface	Incoming VCI	Outgoing Interface	Outgoing VCI
A to Z				
Z to A				

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Question 5

0 pts

A particular ARQ protocol is being implemented with a sending and receiving window size of 3 frames (SWS = RWS = 3). Frames are sequenced using numbers 1, 2, 3, 4, 5, 6, 1, Receiver keeps a pointer **SeqNumToAck**. An ACK is sent to represent that all frames with smaller sequence number are well received. If error happens, receiver holds ACK till the frame of **SeqNumToAck** is received. For example, firstly, frames 1, 2 and 3 are sent, and frame 1 is received (ACK1 is returned), frame 2 is lost and frame 3 is received. Then, **SeqNumToAck=2** and the receiver returns ACK1 again upon receiving frame 3. After timeout, the sender retransmits frame 2 and the receiver returns ACK3 to indicate frame 2 and 3 have correctly received.

Answer the following questions and (or) complete the timeline for partial credits.

- During transmissions, ACK 4 and Frame 5 are lost at their first transmission attempt!

- Bandwidth is infinite, so transmit time of frames is instantaneous (Frames are transmitted instantaneously).
- The transmission time is instantaneous, but the sender can only perform one transmission every $\frac{1}{4}$ of a RTT
- A frame experiencing no delay is received $\frac{1}{2}$ of a RTT after transmission starts (propagation delay) and processing time is zero.
- At a specific time, frames or ACKs are received and processed (instantly) before a transmission decision occurs
 - receiver receives a frame and then sends the ACK if required
 - sender receives an ACK and then determines if a timeout has occurred; it then determines the next frame to transmit (provided the SWS has not been exhausted)
- The timeout period is 2 Round Trip Times (2.0 RTT)
- **Show steps for partial credits. Answer with no steps will receive zero credits.**

a) (4 pts) At what time the first timeout expires?

b) (4 pts) What are inside the sending window (the frame numbers) at time instant 5 RTT?

c) (4 pts) What is the **SeqNumToAck** at time instant 5 RTT?

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Question 6

0 pts

(3pts) What do you expect the course to change in the following semester to better facilitate your learning?

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