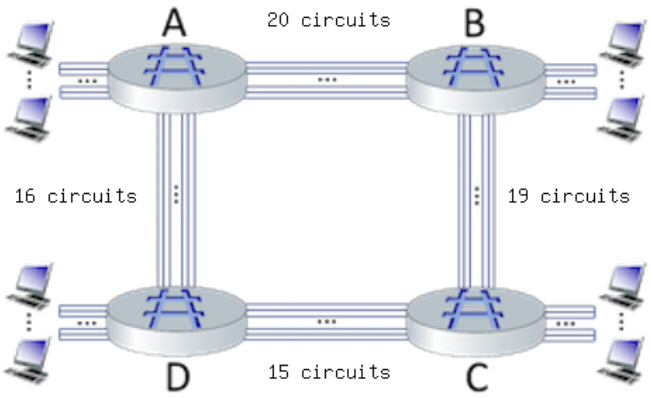
CENG435 DATA COMMUNICATIONS AND NETWORKING
2023-2024 Fall, MIDTERM EXAM PART I *prepared by* Ertan Onur November 20, 2023 18:00

Name: _____ Number: _____ Signature: _____

Dear Students, please note that there are two parts in this exam. You have **75 minutes** in total. Part I consists of multiple choice questions, please use the additional Gradescope answer sheet (mark clearly). Be aware that more than one choice may be correct! Part II consists of two open-ended questions, please do not use any additional sheets and present your answers in the empty boxes provided under the questions. One double-sided cheat sheet is allowed. Closed book, etc. Cheat sheets will be collected with the answer sheets. Write down your assumptions in Part II when needed. **Success**.

1. (1 point) Consider this circuit-switched network with four circuit switches A, B, C, and D. Suppose there are 20 circuits between A and B, 19 circuits between B and C, 15 circuits between C and D, and 16 circuits between D and A. What is the **maximum** number of connections that can be ongoing in the network at any one time?



A. 70 B. 20 C. 16 D. 39

2. (1 point) DNS is **not** used to . . ..
   A. define alias hostnames
   B. balance server loads
   C. indicate mailservers of domains
   D. associate given IP addresses with their users' names

3. (1 point) Suppose a packet is 10K bits long, the channel transmission rate connecting a sender and receiver is 10 Mbps, and the round-trip propagation delay is 10 ms. What is the maximum channel utilization of a stop-and-wait protocol for this channel?
   A. 0.001 B. 0.01 C. 0.1 D. 1.0

4. (1 point) Which of the characteristics below are associated with a P2P approach to structuring network applications (as opposed to a client-server approach)?
   A. There is not a server that is always on.
   B. A process requests service from those it contacts and will provide service to processes that contact it.
   C. There is a server with a well-known server IP address.
   D. HTTP uses this application structure.

Name: _____ Number: _____ Signature: _____

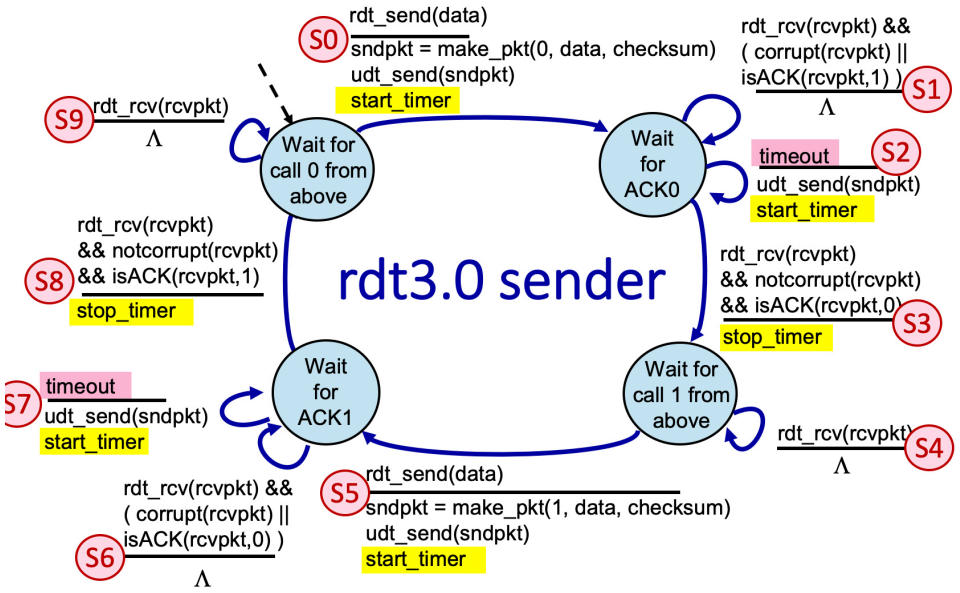
5. (1 point) What do we mean when we say HTTP is stateless? In answering this question, assume that cookies are not used.
   A. An HTTP client does not remember the identities of the servers with which it has interacted.
   B. An HTTP server does not remember anything about what happened during earlier steps in interacting with this HTTP client.
   C. The HTTP protocol is not licensed in any country.
   D. We say this when an HTTP server is not operational.

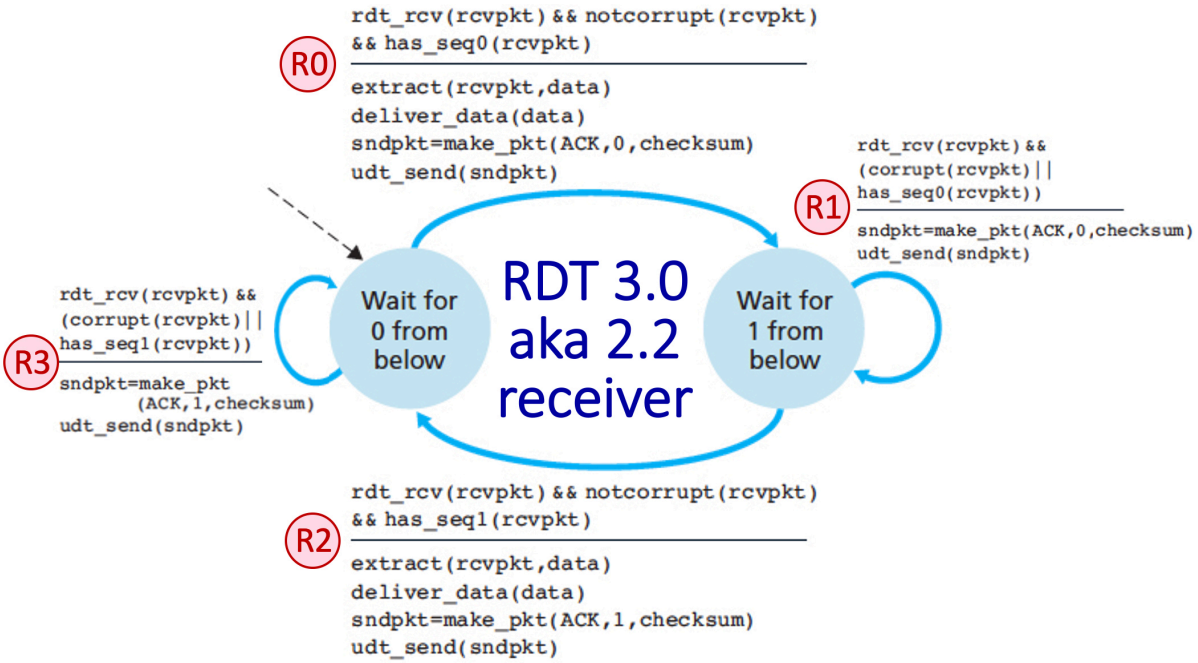
6. (1 point) Which of the following are changes between HTTP 1.1 and HTTP/2?
   A. HTTP/2 has many new HTTP methods and status codes.
   B. HTTP/2 allows objects in a persistent connection to be sent in a client-specified priority order.
   C. HTTP/2 allows a large object to be broken down into smaller pieces, and the transmission of those pieces to be interleaved with transmission of other smaller objects, thus preventing a large object from forcing many smaller objects to wait their turn for transmission.
   D. HTTP/2 provides enhanced security by using transport layer security (TLS).

7. (1 point) Which of the following statements about pipelining are true?
   A. With pipelining, a packet is only retransmitted if that packet, or its ACK, has been lost.
   B. With pipelining, a receiver will have to send fewer acknowledgments as the degree of pipelining increases
   C. With a pipelined sender, there may be transmitted packets ”in flight“ - propagating through the channel - packets that the sender has sent but that the receiver has not yet received.
   D. A pipelined sender can have transmitted multiple packets for which the sender has yet to receive an ACK from the receiver.

Name: _____ Number: _____ Signature: _____

8. (1 point) The rdt3.0 protocol is presented in the following figures.



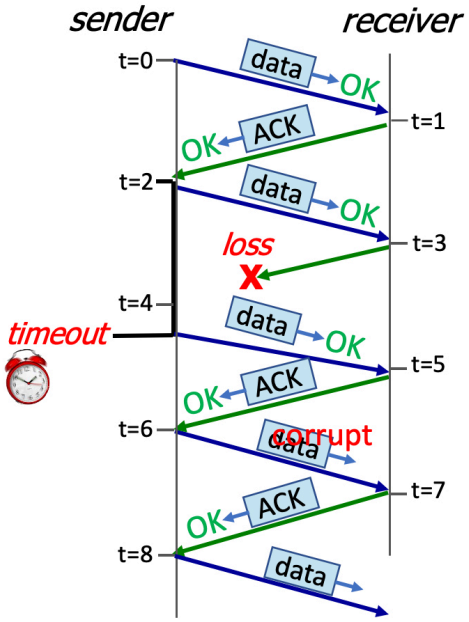


Which of the following sequences of transitions could possibly occur as a result of an initial rdt_send() call at the sender (with no messages initially in the channel), and possible later message corruption/loss and subsequent error recovery?

A. S0, R0, S1, R1 B. S0, R0, S2, R1 C. S0, R0, S3, R2 D. S0, R0, S3, R3

Name: _____ Number: _____ Signature: _____

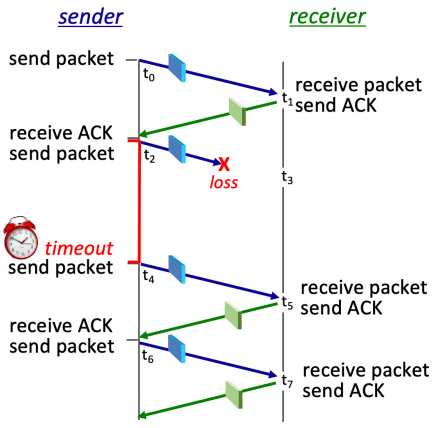
9. (1 point)



Consider the rdt 3.0 sender and receiver. Which of the following sequences of interleaved data sequence numbers and ACK numbers corresponds to those in the messages sent at t=2 (data sequence number); t=3 (ACK number), t=timeout, just after t=4 (data sequence number), and t=5 (ACK number), t=6 (data sequence number), t=7 (ACK number)?

A. 0, 0, 0, 0, 0, 1 B. 1, 1, 1, 1, 0, 1 C. 1, 0, 1, 1, 0, 1 D. 1, 1, 0, 1, 0, 1

10. (1 point)



This diagram shows the rdt3.0 protocol in action. In this diagram, we have intentionally left out the sequence numbers and ACK numbers in the packets sent by rdt3.0. What is the sequence number on the packet sent by the sender at time t_2? .

A. 0 B. 2 C. 1 D. There is no sequence number used on this packet.