

5617
Spring 2020
03/16/2020

Name: _____
Sample Midterm
Time Limit: 120 minutes

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- **Print** your name.
 - Close-book policy: You may not use the text, my class notes and/or any notes and study guides you have created. You may use a calculator. You may not use a cell phone or computer.

Problem	Points	Score
1	12	
2	9	
3	3	
4	2	
Total:	26	

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1. True or False

- (1.1) (1 point) PCs, workstations, Web servers, mail servers, PDAs, Internet-connected game consoles are all devices that fall under the category of hosts.
A. true B. false
- (1.2) (1 point) The most important sources of nodal delay include the nodal processing delay, queueing delay, transmission delay, and propagation delay. Compared to transmission delay and propagation delay, the processing delay is often negligible; however, it strongly influences a router's maximum throughput.
A. true B. false
- (1.3) (1 point) Consider a network of N links, with the transmission rates of the N links being R_1, R_2, \dots, R_N . The throughput for a file transfer in the network will be $\min\{R_1, R_2, \dots, R_N\}$
A. true B. false
- (1.4) (1 point) Among packet-switching and circuit-switching, packet-switching turns out to be the winning principle that powers the Internet because packet-switching is always better than circuit-switching.
A. true B. false
- (1.5) (1 point) In the layered network protocol stack, it is generally easier to make changes to protocols at a high layer than those in the lower layers.
A. true B. false
- (1.6) (1 point) In TCP congestion control, a timeout event will always trigger a transition to the slow start state.
A. true B. false
- (1.7) (1 point) When multiple TCP connections share a common bottleneck, TCP congestion control will ensure fair share among those connections.
A. true B. false
- (1.8) (1 point) The present Internet architecture permits wide flexibility (service), it also gives guidance to the management of a particular network.
A. true B. false
- (1.9) (1 point) In a proprietary network application, the client and server programs running on different end hosts are developed by the same developer (team).
A. True B. False
- (1.10) (1 point) The transport layer can only provide services that are supported in the underlying network layer.
A. True B. False
- (1.11) (1 point) In TCP protocol, the timeout interval is solely determined by the estimated value of RTT.
A. True B. False
- (1.12) (1 point) TCP flow control and congestion control take similar actions — the throttling of the sender.
A. True B. False

2. Multiple choice questions

- (2.1) (1 point) TCP fast recovery can be triggered by
- A. timeout
 - B. duplicate ACKs
 - C. new ACK
 - D. all of the above
- (2.2) (1 point) In Selective Repeat (SR) protocol with a window size N , define `rcv_base` to be the sequence number equal to the base of the window. When the receiver receives a packet (p) with sequence number in `[rcv_base-N, rcv_base+1]`:
- A. p must be a retransmitted packet
 - B. the receiver must generate an ACK for p
 - C. the receiver must have generated an acknowledgment for p before
 - D. all of the above
- (2.3) (1 point) The transport-layer services provided by UDP include
- A. congestion control, error checking
 - B. process-to-process data delivery, error checking
 - C. reliable data transfer, congestion control
 - D. reliable data transfer, process-to-process data delivery
- (2.4) (1 point) Which layer(s) in the Internet protocol stack does a router *not* process?
- A. application layer
 - B. physical layer
 - C. transport layer
 - D. all of the above
- (2.5) (1 point) Which type of DNS server does *not* belong to the DNS server hierarchy
- A. root
 - B. local
 - C. authoritative
 - D. top level
- (2.6) (1 point) The benefits of the Internet's layered architecture does *not* include
- A. the implementation of TCP can be changed without affecting other components as long as the new implementation provides the same TCP service
 - B. new applications can be added without changing the underlying TCP/UDP protocols
 - C. some functionalities are implemented in more than one layer
 - D. a modularity mechanism for the complex Internet system
- (2.7) (1 point) The end to end argument can be viewed as an instance of the Occams Razor, which says
- A. Never make more assumptions than the minimum needed
 - B. Always move the complexity of a distributed towards its edge
 - C. When organized into a layered architecture, always move the complexity of the system upwards to a higher layer, closer to the application
 - D. all of the above

3. **Written questions (essay, computational)** Suppose Host A wants to send a large file to Host B. The path from A to B has three links, of rates $R_1 = 500kbps$, $R_2 = 2Mbps$, and $R_3 = 1Mbps$

(3.1) (1 point) Assume no other traffic in the network, what is the throughput for the file transfer?

(3.2) (2 points) Suppose the file is 4 million bytes. Dividing the file size by the throughput, roughly how long will it take to transfer the file to Host B?

4. Consider the following figure. Assuming TCP Reno is the protocol experiencing the behavior shown above, answer the following questions. In all cases, you should provide a short discussion justifying your answer.

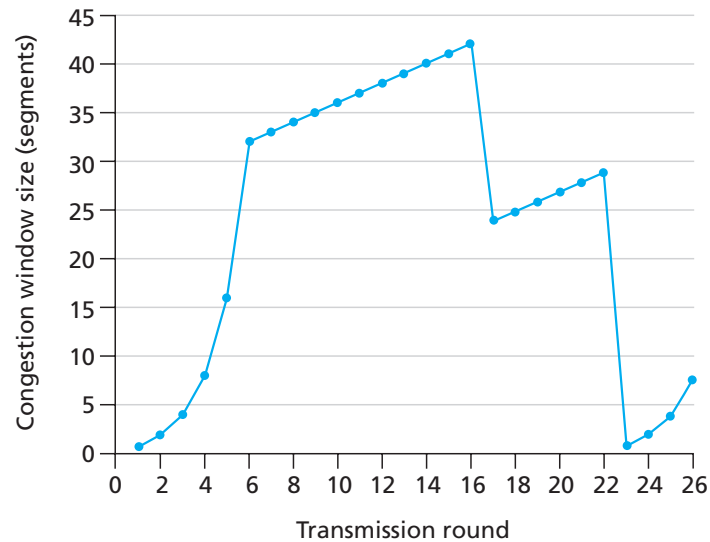


Figure 1: TCP window size as a function of time

- (4.1) (1 point) Identify the intervals of time when TCP slow start is operating.

- (4.2) (1 point) What is the value of ssthresh at the 18th transmission round?