

CPSC 441
COMPUTER COMMUNICATIONS
MIDTERM EXAM

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This is a CLOSED BOOK exam. Textbooks, notes, laptops, personal digital assistants, and cellular phones are NOT allowed. However, **calculators are permitted**.

It is a 50 minute exam, with a total of 50 marks. There are 12 questions, and 7 pages (including this cover page). Please read each question carefully, and write your answers legibly in the space provided. You may do the questions in any order you wish, but please USE YOUR TIME WISELY.

When you are finished, please hand in your exam paper and sign out. Good luck!

Student Name: _____

Student ID: _____

Score: _____ / 50 = _____ %

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Multiple Choice

Choose the best answer for each of the following 8 questions, for a total of 8 marks.

- 1 1. The OSI network reference model has 7 layers rather than the 5 layers in the Internet protocol stack. These two extra layers (session layer and presentation layer) occur between:
 - (a) the user layer and the application layer
 - (b) the application layer and the transport layer
 - (c) the transport layer and the network layer
 - (d) the network layer and the data link layer
 - (e) the data link layer and the physical layer

- 1 2. The User Datagram Protocol (UDP) is an example of a:
 - (a) connection-less network layer protocol
 - (b) connection-oriented network layer protocol
 - (c) connection-less transport layer protocol
 - (d) connection-oriented transport layer protocol
 - (e) all of the above

- 1 3. The transmission time required for sending a 600-byte packet onto a T1 link with 1.5 Mbps (1.5 million bits per second) of transmission capacity is:
 - (a) about 40 microseconds
 - (b) about 300 microseconds
 - (c) about 400 microseconds
 - (d) about 3 milliseconds
 - (e) about 4 milliseconds

- 1 4. The Simple Mail Transfer Protocol (SMTP) is an example of a:
 - (a) “pull” protocol at the application layer
 - (b) “push” protocol at the application layer
 - (c) “pull” protocol at the transport layer
 - (d) “push” protocol at the transport layer
 - (e) cross-layer protocol design

- 1 5. The “persistent connection” feature in HTTP:
 - (a) avoids repeated TCP connection handshaking
 - (b) avoids repeated occurrences of TCP’s slow start algorithm
 - (c) can transfer multiple embedded objects (serially, one at a time)
 - (d) can download typical Web pages more efficiently than non-persistent HTTP
 - (e) all of the above

- 1 6. The two fundamental algorithms in TCP congestion control are called:
 - (a) smooth start and dynamic recovery
 - (b) slow start and fast recovery
 - (c) slow start and congestion avoidance
 - (d) fast retransmit and fast recovery
 - (e) fast start and slow recovery

- 1 7. The basic underlying principle in TCP congestion control is:
 - (a) Additive-Increase-Additive Decrease (AIAD)
 - (b) Additive-Increase-Multiplicative Decrease (AIMD)
 - (c) Multiplicative-Increase-Additive Decrease (MIAD)
 - (d) Multiplicative-Increase-Multiplicative Decrease (MIMD)
 - (e) none of the above

- 1 8. In a datagram-oriented packet-switched network:
 - (a) host-to-host connection setup is required at the network layer
 - (b) end-to-end connection setup is required at the network layer
 - (c) host-to-host connection setup is required at the transport layer
 - (d) end-to-end connection setup is required at the transport layer
 - (e) none of the above

Networking Concepts and Definitions

10 9. For each of the following pairs of terms, define each term, making sure to clarify the key difference(s) between the two terms.

(a) (2 marks) “Time Division Multiplexing” and “Frequency Division Multiplexing”

(b) (2 marks) “processing delay” and “propagation delay”

(c) (2 marks) “Tier-1 ISP” and “Tier-3 ISP”

(d) (2 marks) “POP3” and “IMAP”

(e) (2 marks) “selective repeat” and “go-back-N”

Application Layer Protocols

12 10. When we first introduced the Hyper-Text Transfer Protocol (HTTP/1.0) in class, we referred to it as “stateless”.

(a) (3 marks) What is meant by a “stateless” protocol?

(b) (3 marks) What are the advantages of a “stateless” protocol?

(c) (2 marks) What are the disadvantages of a “stateless” protocol?

(d) (4 marks) Give four examples of how the current usage of the HTTP protocol (including its different versions and features) on the World Wide Web violates the original “stateless” design, and why.

Service Models and Requirements

- 10 11. Different network applications have different service requirements, and thus may make different choices about their use of Internet protocols.
- (a) (2 marks) Give two examples of *delay-sensitive* network applications.

 - (b) (2 marks) Give two examples of *loss-sensitive* network applications.

 - (c) (1 mark) Give an example of a network application that is *both* delay-sensitive and loss-sensitive.

 - (d) (1 mark) Give an example of a network application that is *neither* delay-sensitive nor loss-sensitive.

 - (e) (2 marks) Excluding any of the examples given in (a) through (d) above, identify a network application that uses TCP (only) as its transport layer protocol, and justify why TCP is appropriate for this application.

 - (f) (2 marks) Excluding any of the examples given in (a) through (d) above, identify a network application that uses UDP (only) as its transport layer protocol, and justify why UDP is appropriate for this application.

Transmission Control Protocol

10 12. TCP uses a three-way handshake for reliable connection management, when establishing a logical end-to-end (process-to-process) connection.

(a) (2 marks) What important control information is carried in the first TCP segment (packet) of the three-way handshake, and why?

(b) (2 marks) What important control information is carried in the second TCP segment (packet) of the three-way handshake, and why?

(c) (2 marks) What important control information is carried in the third TCP segment (packet) of the three-way handshake, and why?

(d) (4 marks) How many TCP segments (packets) are required to close a TCP connection? What important control information is carried in these TCP segments, and why?

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