MIDTERM EXAMINATION #2
NETWORKING CONCEPTS 03-60-367-01
UNIVERSITY OF WINDSOR - School of Computer Science
Fall 2011

Question Paper

NOTE: Students may take this question paper with them after the examination.

PLEASE READ CAREFULLY BEFORE YOU START

1. This is a CLOSED book test; no notes, textbooks, calculators or computer aids are allowed.
2. PRINT your NAME legibly and clearly with your Student ID in the space on the Scantron sheet. Use an HB pencil and carefully and thoroughly fill in the circle corresponding to the answer selection for each question.
3. You will be asked to sign your name once before leaving the exam room (sign-out).
4. PLACE ANSWERS on the Scantron sheet provided.
5. If you need more space for rough work you may use any additional space on the examination.
6. You are not allowed to give or receive unauthorized help with your test. Any misconduct, as outlined by the Senate bylaw 31 article I, will be reported accordingly.
7. You have **75 minutes** to complete this test.
8. Copies of the original Midterm examination answer sheets will be returned to students.
9. **This examination has a maximum of 86 marks.**

Good Luck!

All questions are either Multiple Choice or True-False. For each Multiple Choice question, you are to choose only one response which best answers the question. For True-False questions you may only choose one option (True or False).

If an error is made on the Scantron sheet you must carefully erase the error and then carefully and completely indicate your intended choice of answer.

NOTATION: The following symbols are used in the examination.

GB – gigabyte (1024 MB)	**Gbps – gigabits per second**
MB – megabyte (1024 KB)	**KB – kilobyte (1024 B)**
B - 1 byte (8 b)	**b – bit**
m – metre	**km – kilometer (1000 m)**
Mbps – megabits per second	**kbps – kilobits per second (1024 b)**
km/s – kilometers per second	**msec – millisecond (1/1000 second)**

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1. Transport services and protocols provide logical communication between hosts.
   A) True
   B) False

2. Network layer protocols must be defined in every host and router.
   A) True
   B) False

3. In pure P2P networks, peers may change IP addresses.
   A) True
   B) False

4. Flow control is guaranteed to solve congestion problems.
   A) True
   B) False

5. Neither TCP nor UDP provide delay or bandwidth guarantees.
   A) True
   B) False

6. The “Best effort” service model for Internet traffic provides no guarantees of bandwidth, loss or packet order and, further, requires that the occurrence of congestion must be inferred (ie. derived), rather than determined directly through network feedback.
   A) True
   B) False

7. Network services and protocols provide logical communication between processes.
   A) True
   B) False

8. A router is able to direct a message along its path by examining the destination IP address embedded within a UDP packet.
   A) True
   B) False

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9. The IPv4 datagram header has length 20 bytes.
   A) True
   B) False

10. Datagram networks do not require call setup at the network layer.
   A) True
   B) False

11. Circuit switched networks require call setup at the network layer.
   A) True
   B) False

12. An “elastic” service is one that is capable of providing a range of service delivery adapted to available resources.
   A) True
   B) False

13. With end-to-end congestion control congestion is inferred from end-system observed loss and delay.
   A) True
   B) False

14. A packet belonging to a virtual circuit carries the destination address.
   A) True
   B) False

15. Two indicators of congestion in TCP are long delays and lost packets.
   A) True
   B) False

16. Before changing local network IP address, it is not necessary to advise the ISP of the changes.
   A) True
   B) False

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17. The size of the TCP receive window (**`RcvWindow`**) changes throughout the duration of the connection.
A) True
B) False

18. The responsibility for managing localized needs for assigning IP addresses is given to internet service providers.
A) True
B) False

19. Network Address Translation is used because it expands the available device address space through use of port numbers and thereby satisfies the end-to-end argument at the network layer.
A) True
B) False

20. The characteristics of unreliable channels determines the complexity of reliable data transfer protocol.
A) True
B) False

21. Transport protocols run in end systems.
A) True
B) False

22. Internet transport-layer protocols provide delay and bandwidth guarantees.
A) True
B) False

23. A router examines header fields in all IP datagrams passing through it.
A) True
B) False

24. In datagram networks the time a datagram spends in a router buffer is controlled by the round trip time.
A) True
B) False

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25. ICMP messages are carried in IP datagrams.
A) True
B) False

26. IP fragmentation occurs due to different network link types with different maximum transfer units.
A) True
B) False

27. Assuming that two senders and two receivers are connected through a common router with an infinite buffer, it is possible for congestion to arise.
A) True
B) False

28. Network address translation violates the end-to-end argument for each layer to be peer-matched between sender and receiver.
A) True
B) False

29. At the network layer, Dijkstra's algorithm is used to ensure that no redundant packets are received by any node.
A) True
B) False

30. Assume that three routers, U, V and W, have link costs: c(U,V) = 4, c(U,W) = 6 and c(V,W) = 1. Using the Bellman-Ford algorithm, the common routing table for all routers is:

	U	V	W
U	1	4	5
V	4	1	1
W	5	1	1

A) True
B) False

31. In order to establish support for a possible TCP connection session it is necessary for the server side to create a listening socket.
A) True
B) False

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32. In socket programming it may happen that transmitted data may be received out of order, or lost.
A) True
B) False

33. In Virtual Circuits _____ .
A) it is required to allocate bandwidth and router buffers at call setup
B) every router on the source-destination path maintains "state" for each passing connection
C) each packet carries the destination host address
D) All of these responses are correct.

34. Assume that three routers, U, V and W, have link costs: c(U,V) = 3, c(U,W) = 2 and c(V,W) = 10. Using the Bellman-Ford algorithm, the common routing table for all routers is:

	U	V	W
U	0	3	2
V	3	0	5
W	2	5	0

A) True
B) False

35. In TCP based demultiplexing, TCP sockets are identified by _____ .
A) both sender and receiver IP addresses and port numbers
B) sender IP address and port numbers
C) receiver IP address and port number
D) both sender and receiver port numbers

36. In pipelining protocols, the Go-back-N approach requires _____ .
A) Sender can have up to N **`unacked`** packets in pipeline
B) Receiver **`acks`** individual packets
C) If sender timer expires, retransmit all N packets
D) Sender has a timer for each **`unacked`** packet

37. In order to establish a virtual connection (also called a virtual circuit) that permits datagrams to flow between communicating end hosts, it is necessary to _____ .
A) involve all intervening routers
B) initiate the connection using specialized datagrams that carry historical information about the end-end route
C) complete the connection using receiver and sender acknowledgements
D) All of these responses are correct.

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38. Router buffer sizes should be selected based on _____ .
A) message round-trip time (eg. as determined by acknowledgements)
B) link capacity
C) tolerance for data loss due to overflow
D) All of these responses are correct.

39. The first item in an IP datagram is the _____ .
A) header length (in bytes)
B) total datagram length (in bytes)
C) protocol version number
D) type of service

40. IP datagrams may be fragmented into several smaller IP datagrams _____ .
A) that are reassembled at the next router link
B) in order to adapt to the smallest link layer frame
C) that are reassembled only at the final destination
D) Both B and C are correct responses.

41. In TCP "slow start", after establishing the connection, the message flow rate is _____ .
A) increased linearly until first loss event
B) increased linearly after the first loss event
C) increased exponentially until the first loss event
D) None of these responses is correct.

42. In routers, "forwarding" refers to _____ .
A) the manner by which datagrams are routed from input to output ports of individual routers
B) the manner by which datagrams are routed from source to destination ports of end hosts
C) the set of algorithms required to ensure near-optimal path selection of datagrams
D) the control of traffic between communicating routers

43. In datagram networks _____ .
A) routers maintain state about end-to-end connections
B) packets are forwarded using destination host address and virtual circuit number
C) packets between the same source-destination pair may take different paths
D) None of these responses is correct.

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44. Assuming that W is the maximum window size established by TCP "slow start", and the round-trip time is RTT, what is the average throughout of TCP as a function of W and RTT?
A) 0.5 x W/RTT
B) 0.5 x RTT/W
C) 0.75 x RTT/W
D) 0.75 x W/RTT

45. The calculated value of a TCP timeout should _____ .
A) be greater than the round-trip time
B) eliminate unnecessary retransmissions
C) allow quick reaction to changes in network topology
D) All of these responses are correct.

46. Round-trip time (RTT) is estimated based on _____ .
A) a weighted average RTT that is fixed as constant after several samples
B) a weighted average RTT that is continuously updated
C) sampling of routes to determine minimum cost paths
D) All of these responses are correct.

47. TCP flow control is provided by _____ .
A) including value of the receiver buffer available size in acknowledgements
B) keeping out-of-order segments in the receiver buffer
C) keeping the send rate always less than the receive rate
D) All of these responses are correct.

48. The message payload of a UDP segment contains the 4-byte hexadecimal string $E666D555_{16}$. The UDP checksum of this segment is _____ .
A) BBBB
B) BBBC
C) 4444
D) 4443

49. Routers provide feedback to end systems to help in _____ .
A) Network-assisted flow control
B) Network-assisted congestion control
C) End-end congestion control
D) End-end flow control

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50. Packet switching in the network core leads to _____ .
A) bandwidth subdivision
B) resource contention
C) shared circuit switching
D) packet loss

51. Delays in packet delivery are usually caused by _____ .
A) queuing in router buffers
B) overflow in router buffers
C) retransmission of lost packets
D) All of these responses are correct.

52. The term "goodput" refers to the situation where _____ .
A) sending rate is larger than receiving rate
B) sending rate is smaller than receiving rate
C) sending rate is equal to receiving rate
D) packet loss occurs, but it is minimized

53. With TCP in the context of client-server connectivity, a disconnection from the session is achieved _____ .
A) When the client sends a FIN control segment to server and the server returns an ACK.
B) When the client sends a FIN control segment to server and the server returns an ACK followed by a FIN.
C) When the client sends a FIN control segment to server and the server returns an ACK, followed by the server sending a FIN control segment to client and the client returns an ACK.
D) None of these responses is correct.

54. The length of a UDP packet header is _____ bytes.
A) 4
B) 8
C) 12
D) 16

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55. In the client-server model the time it takes for a server to distribute a file of size F to N clients is _____ .
A) proportional to F
B) increases linearly with N, for large N
C) proportional to F/N
D) Both A and B responses are correct.

56. A host-local, application-created, OS-controlled interface into which an application process can both send and receive messages to or from another application process is called a(n) _____ .
A) client-server paradigm
B) peer
C) socket
D) protocol

57. Servers distinguish between multiple connected clients in TCP using _____ .
A) source port numbers
B) client IP addresses
C) client side socket numbers
D) All of these are correct responses.

58. A _____ is a sequence of characters that flow into or out of a process.
A) pipeline
B) stream
C) message flow
D) socket

59. In client-server programming with UDP _____ .
A) sender explicitly attaches IP address and port of destination to each packet
B) there is no handshaking
C) server must extract IP address, port of sender from received packet
D) All of these responses are correct.

60. Gathering data from multiple sockets and enveloping data with a header is called _____ .
A) segmentation
B) multiplexing
C) demultiplexing
D) integration

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61. Transport layer protocols do not provide _____ .
A) logical communication between hosts
B) delay guarantees
C) bandwidth guarantees
D) All of the above responses are correct.

62. Socket API's provide _____ .
A) unreliable datagram transport service
B) reliable, byte stream-oriented transport service
C) Both A and B are correct responses.
D) None of these responses is correct.

63. An ATM network layer service model that guarantees minimum bandwidth, packet ordering and congestion feedback is _____ .
A) ABR
B) CBR
C) UBR
D) VBR

64. An IP datagram must specify _____ .
A) the length (in bytes) of the payload data
B) the maximum number of hops the datagram must take
C) the transport layer protocol to deliver payload to
D) All of these responses are correct.

65. In pipelining protocols, the selective repeat approach requires _____ .
A) Receiver only sends cumulative **`acks`**
B) Sender maintains timer for each **`unacked`** packet
C) Receiver **`acks`** individual packets
D) Both B and C responses are correct.

66. ATM based ABR provides that _____ .
A) the network gives an "elastic" service
B) senders be throttled to the minimum guaranteed rate
C) senders be throttled to the maximum guaranteed rate
D) Both A and C responses are correct

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67. Head-of-the-line blocking can occur in router _____ .
A) can occur in router output queues
B) can occur in router input queues
C) can lead to output buffer overflow
D) Both B and C responses are correct.

68. After establishing a connection, but before exchanging data segments in TCP, it is necessary to initialize _____ .
A) sequence numbers
B) RcvWindow
C) receiving rate at server
D) Both A and B are correct.

69. An IPv6 network address is specified as a(n) _____ address value.
A) 4 byte
B) 10 byte
C) 16 byte
D) 20 byte

70. An IPv6 datagram header has length equal to _____ bytes.
A) 10
B) 20
C) 40
D) 48

71. Using reliable data transfer involves using sequence numbers to deal with _____ .
A) duplicate packet transmission
B) guaranteeing in-order delivery
C) loss of packets
D) Both A and C responses are correct.

72. Hosts and routers utilize _____ to communicate network-level information.
A) TCP
B) UDP
C) ICMP
D) SMTP

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73. In the Go-Back-N approach, the sender _____.
A) retransmits all packets upon expiration of the timer
B) can have up to N unacked packets in pipeline
C) has timer for each packet
D) waits for receiver acknowledgement for each packet sent

74. In the Selective Repeat approach, the sender _____.
A) can have up to N unack'ed packets in pipeline
B) relies upon receiver acknowledgement for each packet sent
C) has a timer for each packet sent
D) All of these responses are correct.

75. Using TCP with rdt3.x, fast retransmit is performed _____.
A) if sender receives 3 ACKs for the same data
B) if sender receives 2 ACKs for the same data
C) if sender is unsure about whether the receiver has received a packet
D) None of these responses is correct.

76. If a router malfunctions, using Link-State protocols, _____ .
A) node can advertise incorrect link cost
B) each node computes only its own table
C) each node's table is used by others so error propagates through network
D) Both A and B are correct responses.

77. The motivation(s) for utilizing Network Address Translation include(s) _____ .
A) making available a range of unique IP addresses for all devices in every subnet
B) ability to change addresses of devices in local network without notifying outside world
C) ability to change ISP without changing addresses of devices in global network
D) establishing direct addressability to local devices inside subnet

78. Multiple TCP streams can distinguished on a given machine using _____ .
A) Ports
B) IP addresses
C) network interface cards
D) All of the above responses are correct.

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79. If Bob and Alice are two peers and each is located behind a Network Address Translation (NAT) server across a wide-area network (WAN) then, in the absence of application-specific NAT configuration, _____ .
A) they can establish a reliable UDP connection
B) they cannot establish a SMTP connection
C) they can establish a TCP connection
D) they cannot establish a TCP connection

80. HTTP is referred to as a stateless protocol because _____ .
A) clients do not maintain historic information about transactions with servers
B) servers and clients do not maintain open connections
C) server maintains no information about past client requests
D) All of the above responses are correct

81. Which layer has the responsibility of transferring datagrams from one node to adjacent node(s) over a link?
A) Application layer
B) Transport layer
C) Link layer
D) Network layer

82. By using Web caching _____ .
A) it is possible to reduce response time for client request
B) it is possible to reduce traffic on an institution's access link
C) the cache acts as both client and server
D) All of the above responses is correct

83. When the link cost increases suddenly between two routers in a network, poisoned reverse is used to _____ .
A) accelerate the convergence to a stable routing table
B) replace all update link costs initially to infinity for all routes through the affected routers
C) guarantee unique routing solutions in the final routing tables
D) Both A and B responses are correct.

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84. Routing algorithms may be classified based on _____ .
A) availability of global information
B) availability of local information
C) rate of change of network paths
D) All of the above responses are correct.

85. A subnet may be defined as any interconnected set of computers and routers (or switches) that can operate in isolation from other subnets, or in cooperation with other subnets.
A) True
B) False

86. Consider sending a 6000 byte datagram into a link that has a maximum transfer size (MTU) of 1000 bytes. How many fragments are generated?
A) 8
B) 7
C) 6
D) 5

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