MIDTERM EXAMINATION #2

COMPUTER NETWORKS : 03-60-367-01

UNIVERSITY OF WINDSOR

SCHOOL OF COMPUTER SCIENCE

Fall 2017 - 75 minutes

This document contains all questions for the examination. Each student must surrender **only** their completed Scantron answer sheets. Each student may take this examination question paper for future reference. Although you may write on this document, it will not be graded if it is submitted. There is no need to place your name on this document.

PLEASE READ CAREFULLY BEFORE YOU START

1. This is a CLOSED book test; no notes, textbooks, calculators or computer aids are allowed.
2. You will be asked to sign your name once before leaving the exam room (sign-out) and after submitting your exam answer sheet (Scantron computer sheet).
3. PLACE YOUR NAME AND STUDENT ID NUMBER on the Scantron sheets provided – you must use a pencil (NO PENs). Your examination is Course/Section: 03-60-367-01
4. PLACE ANSWERS on the Scantron sheets provided – you must use a pencil (NO PENs).
5. 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.
6. **You have 75 minutes to complete this test, starting from the time stated by the instructor.**
7. **When the instructor indicates that time has elapsed all students must stop writing answers and surrender their Scantron answer sheets immediately to the proctors.**
8. Photocopies of Scantron answer sheets will be returned to students after marking. Examination questions and answers will be provided using the course website.
9. The total (maximum possible) mark on this exam is **99.**

Good Luck!

All questions are Multiple Choice (or True-False for only two choices). 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). There may be up to five (5) response options (A-E) for some questions. Place all answers on the Scantron sheet provided. The examination will be marked using a special Scantron reader and computer in Information Technology Services (ITS).

If an error is made in filling in the Scantron sheet bubbles you must carefully and completely erase your mistake and then indicate your choice of answer. Completely and carefully fill the circle that indicates your answer to each question. Make sure you have selected the correct question number on the Scantron sheet corresponding to the question on the examination question paper.

Be sure to fill in your name (Surname first, then your common name second) and SID and other required information – you may leave the TestID blank. For your name and SID both print in the boxes provided and also fill in the bubbles on the Scantron sheet.

WARNING !
Read and think carefully about each question before answering.
Questions have been scrambled by topic. Keep your attention on your own test paper and answer sheet.

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1. All datagrams contain 2 ports.
   A) True
   B) False

2. TCP abstracts data communication to appear as an apparent stream of flowing data.
   A) True
   B) False

3. SSL was added as an enhancement to TCP in order to provide process-to-process security.
   A) True
   B) False

4. Host A is sending Host B a large file over a TCP connection. Assume Host B has no data to send Host A. Host B will not send acknowledgments to Host A because Host B cannot piggyback acknowledgements on data.
   A) True
   B) False

5. With Selective Repeat, it is possible for the sender to receive an ACK for a packet that falls outside of its current window.
   A) True
   B) False

6. Given the two bytes: `01011100` and `01100101`, the 1's complement of the sum of these two bytes is `00111110`.
   A) True
   B) False

7. A link-layer switch forwards a packet based on the packet's IP (layer 3) address.
   A) True
   B) False

8. The main function of the data plane is packet forwarding.
   A) True
   B) False

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

10. If a data payload bit is modified during transmission between routers, the IP header checksum can detect the change.
   A) True
   B) False

11. Packet loss occurs when the packet arrival rate to a link exceeds the output link capacity.
   A) True
   B) False

12. Suppose Host A is sending a large file to Host B over a TCP connection. If the sequence number for a segment of this connection is *m*, then the sequence number for the subsequent segment (assuming one exists) will necessarily be *m*+1.
   A) True
   B) False

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

14. The TCP segment has a field in its header for `rwnd`.
   A) True
   B) False

15. The alternating-bit protocol is the same as the Selective Repeat protocol with a sender and receiver window size of 1.
   A) True
   B) False

16. Suppose that the last `SampleRTT` in a TCP connection is equal to 1 second. The current value of `TimeoutInterval` for the connection will necessarily be $\geq$ 1 second.
A) True
B) False

17. With GoBackN, it is possible for the sender to receive an ACK for a packet that falls outside of its current window.
A) True
B) False

18. The size of the TCP `rwnd` never changes throughout the duration of the connection.
A) True
B) False

19. Consider congestion control in TCP. When the timer expires at the sender, the value of *ssthresh* is set to one-half of its previous value.
A) True
B) False

20. Head-of-the-line blocking occurs only at the input port.
A) True
B) False

21. With a window size of 1, Selective Repeat, GoBackN, and the alternating bit protocol are functionally equivalent.
A) True
B) False

22. ICMP (Internet Control Message Protocol) messages are carried in IP datagrams.
A) True
B) False

23. Slow start and congestion avoidance are mandatory in TCP congestion-control algorithm.
A) True
B) False

24. Window size in TCP is used to avoid congestion within the IP network
A) True
B) False

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

26. Transport layer protocols must be defined in every router.
A) True
B) False

27. Network services and protocols provide logical communication between hosts.
A) True
B) False

28. Datagram networks require call setup at the network layer.
A) True
B) False

29. Each router is assigned multiple IP addresses.
A) True
B) False

30. SDN stands for _____ .
A) Standard Destination Node
B) Source Defined Node
C) Source-Destination Networking
D) Software Defined Networking
E) None of the responses above are correct.

31. In routing tables, a forwarding rule is only based on _____ .
A) source address
B) destination address
C) both source and destination addresses
D) Forwarding rules are not based on addresses alone.
E) None of the responses above is correct.

32. Assume that 5 packets are sent from a single source to the same destination using Go-Back-N. If the first packet reaches its destination but its acknowledgement is lost, describe what happens.
A) The packet loss caused a time out after which all the five packets were retransmitted.
B) Loss of an ACK didn't trigger any retransmission as Go-Back-N uses cumulative acknowledgements.
C) The message attempt fails and must be restarted from the beginning.
D) The packet loss caused a time out after which only the first packet was retransmitted.
E) None of the responses above is correct.

33. Which of the queuing disciplines below ensures that all packets depart a router in the order in which they arrive?
A) Round Robin (RR)
B) Priority
C) Weighted Fair Queuing (WFQ)
D) First In First Out (FIFO)
E) Both A and C are correct.

34. _____ delay is the result when packets wait to be transmitted onto the next link.
A) Transmission
B) Propagation
C) Nodal processing
D) Queuing

35. Router switching may be accomplished using _____ .
A) memory
B) bus
C) crossbar
D) All of the above responses are correct

36. The _____ is defined as the fraction of time the sender is actually busy sending bits into the channel.
A) utilization
B) capacity
C) efficiency
D) None of these responses is correct.

37. Suppose that an application generates chunks of 60 bytes of data every 10 msec, and each chunk gets encapsulated in a TCP segment and then an IP datagram. What percentage of each datagram will be overhead?
A) 25%
B) 40%
C) 50%
D) 60%
E) 75%

38. To better manage the network, network administrators usually divide a single network into _____ by allocating ranges of IP addresses within the network.
A) islands
B) subnets
C) groups
D) local area networks

39. In circuit switching networks, which of the following options is true?
A) Transmission rate cannot be guaranteed.
B) The resources needed along a path are reserved.
C) Uses the resources on demand.
D) None of the responses above is correct.

40. The type of domain that deals with ***edu, com, net, org,*** and other similar extensions, is called a _____ .
A) Root DNS server
B) Top-level DNS server
C) Authoritative DNS server
D) Local DNS server

41. Which of the following is not a service provided by DNS?
A) translating host names
B) Mail server aliasing
C) congestion control
D) load distribution
E) All of the above responses are valid services provided by DNS

42. Internet protocols define _____ .
A) format of messages
B) actions taken on message transmission and receipt
C) order of messages sent and received among network entities
D) All of the responses above are correct

43. Consider sending a 2600-btye datagram into a link that has an MTU of 1000 bytes. Suppose the original datagram is stamped with the identification number 422. How many fragments are generated?
A) 1
B) 2
C) 3
D) 4
E) 5

44. In the datagram format for IPv4, the _____ field is included to ensure that datagrams do not circulate forever in the network.
A) destination
B) source
C) protocol version
D) time-to-live
E) options

45. _____ is used to extend the use of the limited IPv4 address space.
A) DHCP
B) IPv6
C) DNS
D) TTL
E) NAT

46. IPv6 has _____ addresses.
A) 32 bit
B) 64 bit
C) 128 bit
D) variable length
E) None of these responses is correct.

47. Consider sending a 5000-btye datagram into a link that has an MTU of 1000 bytes. Suppose the original datagram is stamped with the identification number 386. What is the size of the last datagram fragment, including the IP header?
A) 60 bytes
B) 100 bytes
C) 386 bytes
D) 1080 bytes
E) None of the responses above are correct.

48. In packet switched networks, store and forward refers to: _____ .
A) entire message must arrive at router before it can be transmitted on next link
B) scheduling of packets to avoid congestion
C) entire packet must arrive at router before it can be transmitted on next link
D) entire packet must be stored on router until acknowledgement received

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

50. Ethernet is _____ .
A) One of the physical media
B) One of the LAN technologies
C) One of the WAN technologies
D) A client-server network

51. Packet delay may be caused by _____ .
A) time required for nodal processing requirements
B) time required for queueing
C) transmission times
D) propagation times
E) All of these responses are correct.

52. Photonic (ie. optical) networks utilize _____ switches.
A) CBR
B) TCP/IP
C) LAN
D) ATM
E) Ethernet

53. A checksum is used to provide _____ .
A) error detection
B) error correction
C) error avoidance
D) All of these responses are correct.

54. Embedding payloads and protocol headers within logically layered packages refers to _____ .
A) message encryption
B) reliability assurance
C) the way that IP is used for transmitting messages
D) message encapsulation

55. The IETF is responsible for _____ .
A) setting Internet standards
B) ensuring that the Internet is operating correctly
C) creating new Internet protocols
D) approving new Internet Service Providers

56. Which network stack layer is in charge of dealing with flow control?
A) Application
B) Network
C) Physical
D) Link
E) None of these responses is correct.

57. The time it takes for a small packet to travel from client to server and then back to the client is called _____ .
A) Round-trip time
B) Propagation time
C) Transmission time
D) Delay time

58. Which of the following options control the sending and receiving of information within the Internet?
A) protocols
B) packets
C) IPv4
D) RFC

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

60. 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 same source-destination pair may take different paths
D) packets between same source-destination pair may take the same paths
E) Both C and D responses above are correct.

61. 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

62. Transfer across TCP streams is _____ .
A) half duplex
B) full duplex
C) best available multiplex
D) None of the responses above is correct.

63. A DNS resource record is a tuple that contains _____ .
A) Name, Value
B) Name, Value, Type
C) Name, Value, Time-to-live
D) Name, Type, Time-to-live
E) Name, Value, Type, Time-to-live

64. Which option best describes the server program in a connection-oriented transport service?
A) Create socket and then, in a loop, wait for incoming connection request, read request, write reply, then close
B) Create socket, send request, read reply, close
C) Create socket, read request, write reply
D) Create socket, send request, read reply, close

65. What is a Distributed Hash Table (DHT)?
A) A Server side searching table.
B) It is used in DNS.
C) An indexing and searching technique for a P2P network.
D) None of the responses above is correct.

66. The socket that represents a ‘passive open’ is a(n) _____ socket.
A) Server
B) Client
C) TCP
D) Application

67. Interconnected routers in the Internet exist _____ .
A) within access networks
B) in the network core, as a network of networks
C) on the network edge
D) None of these responses is correct

68. Transport services and protocols _____ .
A) provide communication between system processes running on different hosts
B) are provided in hosts and routers
C) make more than one transport protocol available to applications
D) All of the above responses are correct

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

70. Assume that 5 packets are sent from a single source to the same destination using Go-Back-N. If the first packet is lost before any of the 5 packets reaches its destination, describe what happens.
A) The packet loss caused a time out after which all the five packets were retransmitted.
B) Loss of an ACK didn’t trigger any retransmission as Go-Back-N uses cumulative acknowledgements.
C) The message attempt fails and must be restarted from the beginning.
D) The packet loss caused a time out after which only the first packet was retransmitted.
E) None of the responses above is correct.

71. A transport layer protocol provides for logical communication between _____ .
A) processes
B) hosts
C) routers
D) None of these responses is correct.

72. The maximum amount of data that can be placed in a segment is limited by the _____ .
A) maximum bandwidth available
B) protocol version used
C) maximum segment size
D) maximum transmission unit

73. Which of the following options show the correct name for a packet of information in each layer?
A) application layer: frame, Transport layer: segment, Network layer: datagram, Link layer: message
B) application layer: message, Transport layer: frame, Network layer: datagram, Link layer: segment
C) application layer: message, Transport layer: segment, Network layer: datagram, Link layer: frame
D) None of the responses above is correct.

74. In a receiving host, data is delivered from the transport layer to processes through an intermediary _____ .
A) port
B) socket
C) IP address
D) None of these responses is correct.

75. A network's speed is expressed in terms of _____ .
A) Routing protocol
B) Round trip time
C) Bit rate and latency
D) I/O buffer response
E) Delay and Routing

76. Packet loss _____ .
A) may be dealt with by retransmitting packets, or ignoring them completely
B) may be reduced or eliminated by expanding hardware buffers
C) is not a problem with current technologies
D) Both A and B responses are correct.
E) None of these responses is correct.

77. To maintain the EstimatedRTT of the SampleRTT's, TCP uses the _____ of the SampleRTT's.
A) weighted average
B) minimum
C) maximum
D) simple average

78. The _____ imposes a constraint on the rate at which a TCP sender can send traffic into the network.
A) congestion indicator
B) congestion window
C) transmission buffer
D) choke packet

79. Which of the following is not a component of a route?
A) Input ports
B) Output ports
C) Switching ports
D) Switching fabric

80. As segments arrive from the network, a destination host directs each segment to the appropriate socket by examining the destination port number. This process is known as _____ .
A) multiplexing
B) demultiplexing
C) routing
D) segmentation

81. The _____ protocol is used for error reporting in the network layer.
A) TCP
B) checksum
C) SMTP
D) IPsec
E) ICMP

82. What is the TCP response to a timeout event?
A) sending the next packet
B) retransmitting the segment that caused the timeout
C) restarting the connection
D) None of these responses is correct.

83. TCP attempts to give each connection traversing a link an equal share of the link's bandwidth. This service by TCP is known as _____.
A) bandwidth control
B) congestion control
C) equal-opportunity
D) Round-Robin scheduling
E) None of these responses is correct.

84. Port numbers in the range 0 - 1023 are known as _____ .
A) small port numbers
B) destination port numbers
C) source port numbers
D) commercially available port numbers
E) well-known port numbers

85. The IP service model is based on a _____ delivery service.
A) guaranteed
B) reliable
C) best-effort
D) None of these responses is correct.

86. Which of the following is correct about TCP?
A) provides full-duplex service
B) provides point-to-point connection
C) starts the connection using three-way handshake
D) All of the responses above are correct.

87. A datagram network provides network-layer _____ service.
A) connectionless
B) connection
C) core implementation dependent
D) None of the responses above is correct.

88. Router buffer sizes should be selected based on _____ .
A) message round-trip time
B) link capacity
C) tolerance for data loss due to overflow
D) All of the responses above are correct.

89. Forwarding refers to _____ .
A) the manner by which datagrams are routed from source to destination ports of end hosts
B) the manner by which datagrams are routed from input to output ports of individual routers
C) the set of algorithms required to ensure near-optimal path selection of datagrams
D) the manner by which datagrams are routed from source to destination between adjacent routers

90. 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 subnets
E) All of the responses above are correct.

91. The IPv6 datagram header has length _____ bytes.
A) 64
B) 32
C) 128
D) 40
E) Both A and B responses are correct when considering header options.

92. In IPv4, the IP address expressed in 32-bit binary notation as

`00001000 00000000 00000001 00000010`

can be written in dotted-decimal notation as _____ .
A) 100.0.1.10
B) 16.0.1.2
C) 8.0.1.10
D) 8.1.0.2
E) None of the responses above is correct.

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

94. 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.

95. 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.

96. 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.

97. 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.

98. 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.
E) None of the responses above is correct.

99. 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

End of Examination.