Name _____

Student number _____

SE 4C03 Winter 2006

Midterm Test Answer Key

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You have 50 minutes to complete this test consisting of 7 pages and 25 questions. You may use your notes and textbooks, but you may not use any calculators or other electronic devices. Circle the *best* answer for the multiple choice questions, and write the answer in the space provided for the other questions. Good luck!

(1) [2 pts.] A TCP segment normally would never have both its `SYN` and `ACK` code bits set to 0. Is this statement true or false?

(a) [True.]
(b) False.

(2) [2 pts.] The IP datagram source route option can be used to direct an IP datagram to an address that is different from its destination address. Is this statement true or false?

(a) [True.]
(b) False.

(3) [2 pts.] The TCP protocol has no mechanism for a receiver to tell a sender that it has received more than one copy of a TCP segment. Is this statement true or false?

(a) [True.]
(b) False.

(4) [2 pts.] Every organization has a security posture. Is this statement true or false?

(a) [True.]
(b) False.

(5) [2 pts.] UDP protocol ports reside in Platonic heaven. Is this statement true or false?

(a) [True.]
(b) False.

(6) [2 pts.] An IP datagram traveling across the Internet can undergo fragmentation more than once? Is this statement true or false?

(a) [True.]
(b) False.

(7) [2 pts.] The development of the TCP/IP protocol suite was funded by the U.S. Department of Defense. Is this statement true or false?

(a) [True.]
(b) False.

(8) [2 pts.] What happens when the time-to-live field of an IP datagram is reduced to 0?

(a) The datagram is returned to its source address.
(b) [The datagram is "dropped".]
(c) An ICMP message is sent to the datagram's destination address.
(d) The datagram is encapsulated in an ICMP message that is returned to the datagram's source address.

(9) [2 pts.] Which protocol is now mostly obsolete?

(a) ARP.
(b) [RARP.]
(c) ICMP.
(d) UDP.

(10) [2 pts.] A host's operating system normally protects the _____ of its routing table.

(a) Size.
(b) Privacy.
(c) [Integrity.]
(d) All of the above.

(11) [2 pts.] Which Ethernet wiring scheme is the best with respect to protecting privacy?

(a) Coaxial cable.
(b) Coaxial cable with repeaters.
(c) Twisted pair with hubs.
(d) [Twisted pair with switches.]

(12) [2 pts.] Which network service can be used to probe a network?

(a) Telnet.

(b) Ping.

(c) Traceroute.

(d) All of the above.

(13) [2 pts.] Which TCP code bit is used to immediately kill a TCP connection.

(a) `FIN`.

(b) `ABT`.

(c) `RST`.

(d) `URG`.

(14) [2 pts.] Which of the following is the most effective means to handle network congestion?

(a) The IP protocol.

(b) ICMP source quench messages.

(c) The UDP protocol.

(d) The TCP protocol.

(15) [2 pts.] The acknowledgment field of a TCP segment sent by the receiver tells the sender

(a) Which TCP segments have been received.

(b) Which TCP segments have not been received.

(c) The last TCP segment that has been received.

(d) The first TCP segment that has not been received.

(16) [2 pts.] The routing table of a desktop computer connected to the Internet will usually contain

(a) 1 direct route and 1 indirect route.

(b) 1 direct route and 2 indirect routes.

(c) 2 direct routes and 1 indirect route.

(d) 2 direct routes and 2 indirect routes.

(17) [2 pts.] A host is called an *internet router* if

(a) It routes IP datagrams.

(b) It has interfaces to more than one SPN.

(c) It can forward incoming IP datagrams.

(d) Its routing table includes at least one indirect route.

(18) [2 pts.] Which of the following network technologies has the fastest transmission speed?

(a) Ethernet.

(b) Wireless Ethernet.

(c) FDDI.

(d) ATM.

(19) [2 pts.] A patch cable is used to connect

(a) An Ethernet NIC to another Ethernet NIC.

(b) An Ethernet NIC to a hub.

(c) A hub to another hub.

(d) All of the above.

(20) [2 pts.] What is known about an IP datagram that arrives at a host?

(a) The IP address of the interface from which it originated.

(b) The port of the process that sent it.

(c) The network interface on which it arrived at the host.

(d) All of the above.

(21) [5 pts.] Fill in the blank. Ethernet is to the IP protocol as ATM or the IP protocol is to the TCP protocol.

(22) Suppose a class A network of IP addresses is partitioned into a set S of subnets such that the mask of each subnet in S is 255.255.192.0.

(a) [5 pts.] How many subnets are in S?

Answer: $2^{8+2} = 2^{10}$.

(b) [5 pts.] How many IP addresses are in the largest subnet in S?

Answer: $2^{6+8} = 2^{14}$.

(23) Consider the IP address 220.240.87.131.

(a) [5 pts.] Write this address in binary (base 2).

Answer: 11011100.11110000.01010111.10000011

(b) [5 pts.] Write this address in hexidecimal (base 16).

Answer: DC.F0.57.83

(c) [5 pts.] What is the network address of the class network that contains this address?

Answer: 220.240.87.0

(24) [10 pts.] Briefly explain how the traceroute program is usually implemented.

Answer: The traceroute program is used to find the sequence $a_1, a_2, \ldots$ of IP addresses that are traversed by an IP datagram sent from the home host to a target destination IP address a. This sequence is called the *route* from the home host to a. The program works by sending a sequence $d_1, d_2, \ldots$ of UDP datagrams and then waiting for ICMP messages to be returned. For each d_i the destination address is a, the destination port is some UDP port that is unlikely to be in use, and the time-to-live field is set to i. If an ICMP time exceeded message is received for d_i, the source address of the message is a_i, the ith member of the route. If an ICMP port unreachable message is received for d_i, the ith and last member of the route is $a_i = a$, the target destination address.

(25) [20 pts.] Below is a diagram of a conventional internet using the TCP/IP protocols.

THE DIAGRAM IS NOT SHOWN.

$\mathsf{H}_1, \ldots, \mathsf{H}_4$ are hosts. $\mathsf{I}_1, \ldots, \mathsf{I}_8$ are interfaces to the single physical networks $\mathsf{SPN}_1, \ldots, \mathsf{SPN}_5$. $\mathsf{J}_1, \ldots, \mathsf{J}_4$ are interfaces to loopback networks. There are other hosts and interfaces that are not shown. The following table shows what IP addresses and subnet masks are assigned to the $\mathsf{I}_1, \ldots, \mathsf{I}_8$ interfaces.

Interface	IP Address	Subnet Mask
I_1	201.148.21.130	255.255.255.192
I_2	201.148.21.196	255.255.255.192
I_3	201.148.21.245	255.255.255.192
I_4	201.148.30.99	255.255.255.240
I_5	201.148.30.101	255.255.255.240
I_6	201.148.30.102	255.255.255.240
I_7	201.148.30.146	255.255.255.240
I_8	201.148.30.180	255.255.255.240

Recall that a route in a subnet routing table has the form (a, m, r, i) where:

- a is the address of a subnet S.
- m is the mask of S.
- r is an IP address for the "next hop" ($r = *$ for direct routes).
- i is an interface.

Write down the routing table for H_2 as a list of (a, m, r, i) tuples. *Do not use a default route or any host-specific routes.*

Answer:

(127.0.0.0,	255.0.0.0,	$*$,	J_2)
(201.148.21.192,	255.255.255.192,	$*$,	I_3)
(201.148.30.96,	255.255.255.240,	$*$,	I_4)
(201.148.21.128,	255.255.255.192,	201.148.21.196,	I_3)
(201.148.30.144,	255.255.255.240,	201.148.30.101,	I_4)
(201.148.30.176,	255.255.255.240,	201.148.30.102,	I_4)