



Final Exam

Version 1

Name: _____ Student Id: _____

Signature: _____ Section: _____

Duration: 120 minutes

Instructions

- There are 6 problems and 10 pages. Make sure you have all of them.
- The exam is closed book, closed notes, closed calculators, and closed neighbors.
- Answer questions in the space provided.
- The questions **not sorted by difficulty**. Scan the whole exam before you start working.
- Your handwriting should be readable so it can be graded. Include all work or justification for partial credit.

Problem 1	25	
Problem 2	13	
Problem 3	7	
Problem 4	30	
Problem 5	14	
Problem 6	10	
Total	100	

Problem 1-[25 points]

True or False questions. Circle **T** if you think that the answer is mostly correct or **F** if you think that the answer is mostly incorrect. **Note that two wrong answers cancel a correct one.**

ICMP, ARP, DNS and TCP run over IP.	T	F
The length of an IPv4 datagram header can vary depending on the options used. The largest possible IP header size is 20 bytes.	T	F
The header length field in an IPv4 datagram contains the size of an IP header measured in number of words	T	F
Domain names are hierarchical, with the most significant name on the extreme left.	T	F
Throughput in a network is usually measured in bits per second, and is a fundamental property of networks which can be measured quantitatively.	T	F
A signal requires a small amount of time to travel across a wire. The time is generally proportional to the distance traveled. Such delays are called the switching delays.	T	F
Routers can have more than four interfaces.	T	F
If D_0 is the delay when the network is idle, and U is a value between 0 and 1 that denotes the current utilization, then $D_0 / (1-U)$ gives a value for the effective delay.	T	F
arpa is a special DNS top level domain that is used for translating names into IP addresses.	T	F
RARP is an Internet layer protocol that can be used by IP to send control information.	T	F
The DNS client is often referred to as DNS agent.	T	F
To write a connectionless server the following sequence of system calls is required: socket(), bind(), listen(), recvfrom(), sendto(), and closesocket()	T	F
DHCPREQUEST message can be sent from a DHCP client to DHCP servers for requesting the parameters offered by one of the servers and declining other offers.	T	F
Data overrun may occur when the receiving computer is faster than the sending computer.	T	F
www.largebank.com and www.largebank.ny.us can have the same IP address.	T	F
A useful socket function is <i>Gethostbyname</i> . This function takes as an argument an IP address in dotted decimal notation, and returns a domain name.	T	F
ARP can be used in point-to-point networks the same way it is used in local area networks.	T	F
Distance vector is a broadcast-based protocol while link-state is a multicast based protocol.	T	F
When a DNS server receives a DNS iterative query from a client then it must do whatever possible to translate the name in the query into an IP address and returns the result to the client.	T	F
Bootp protocol does not require any manual configuration when assigning IP addresses to computers.	T	F

Problem 2-[13 points]

Multiple Choice Questions. Circle what you believe is the BEST answer.

1. Assume a system with fixed-length 250-byte packets where each packet contains 25 bytes of headers and trailers (thus, the data payload is 225 bytes). Packets with less payload than 225 bytes are "padded out" to a full length payload. For a 600 byte message, the overhead (in %) in this system is :
 - a. 80%
 - b. 11%
 - c. 20%
 - d. 40%
 - e. none of the above

2. DHCP supports the following three mechanisms for IP address allocation:
 - a. *dynamic* allocation, *manual* allocation, and *on-demand* allocation.
 - b. *permanent* allocation, *dynamic* allocation, and *automatic* allocation.
 - c. *manual* allocation, *on-demand* allocation, and *permanent* allocation.
 - d. *manual* allocation, *dynamic* allocation, and *permanent* allocation.
 - e. none of the above.

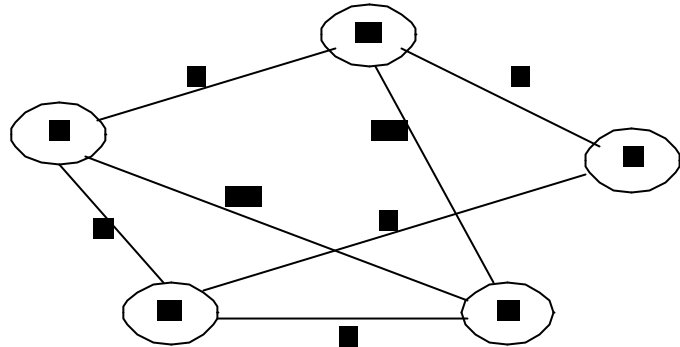
3. ICMP never returns errors for
 - a. ICMP error messages.
 - b. a datagram destined for an IP broadcast address.
 - c. a fragment other than the first.
 - d. all of the above.
 - e. none of the above.

4. ICMP *time exceeded* can be sent by a host when
 - a. a datagram is processed and its time-to-live reaches 0 then the host discards it and notifies the sender.
 - b. if reassembly timer expires before all fragments from a given datagram arrives, the destination discards the datagram and notifies the sender.
 - c. all of the above
 - d. the TCP timer for a message expires.
 - e. none of the above

5. The size of the largest UDP message that can fit into a single Ethernet frame is
 - a. 1480 octets
 - b. 1500 octets
 - c. 1472 octets
 - d. 65535 octets
 - e. none of the above

Problem 3-[7 points]

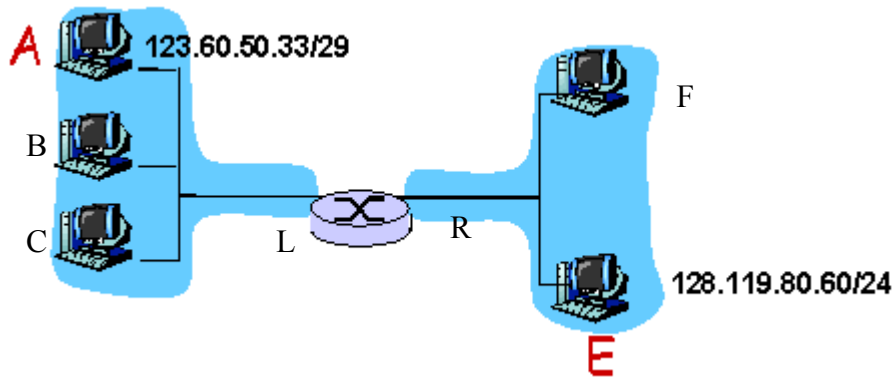
Consider the network shown below. Show the steps of computing the routing table of router D using the distance vector algorithm when D receives consecutively vectors from A, B and C. Assume that each node knows initially about its neighbors.



Problem 4-[30 points]

Answer the following questions. Make your answer as short as possible as you will not get credit for long answers.

- (15 points) Consider the simple network shown below with the IP addresses and network prefix indicated



- Write down an IP address for each interfaces at all hosts and routers in the diagram. Note that the IP addresses and network prefix for A and E are as given. **Remember to consider the fact that the addresses containing all ones and all zeros for the host part of the address are reserved and cannot be assigned to interfaces.**
- Given your IP addresses from above, what are the contents of the routing table in the router.

Destination Net	Mask	Next hop

- Suppose the router is removed from the network, and all five hosts are connected together through one shared link. Would the IP addresses need to be changed? Explain your answer.

2. (3 points) consider the following IP address 172.16.10.50/27
- What is the network part value of this address?
 - What is the host part value?
 - Provide the range of IP addresses that can be assigned to hosts in this network?
3. State to which class each of the addresses below belongs to. If the address is a special address, explain its meaning and why it is used. (6 points).
- 130.233.224.51
 - 127.0.0.1
 - 193.254.254.255
 - 0.0.0.0
 - 255.255.255.255
 - 255.255.240.0

4. Consider sending an IP packet of 3000 bytes into a link that has an MTU size of 500 bytes. Suppose that the original datagram is stamped with the identification number 422. How many fragments are generated? What are the values of the total length, fragmentation offset, fragmentation flags (D and M) of each fragment? (6 points)

Problem 5 [14 points]

Answer the following questions. Make your answer as short as possible as you will not get credit for long answers.

1. (7 points) Following are 7 functions. Identify which layer of the TCP/IP model each function is most likely to belong to. It is possible that a function cannot be mapped to any layer. If this is the case, explain why.
 - a) Recovering lost packets between two nodes separated by multiple hops
 - b) Defining the pin-outs in a connector used to attach to a network cable
 - c) Providing an interface to a visual packet monitoring program
 - d) Translating between names and IP addresses
 - e) Finding the shortest path between two nodes separated by multiple hops
 - f) Providing communication between processes running on end-systems on possibly different networks
 - g) Interconnecting networks that use different technologies, including different physical addressing formats

2. (3 points) UDP versus TCP
 - a. Give two advantage for the connectionless UDP protocol over the connection oriented TCP protocol.

 - b. What is the main advantage of the connection-oriented TCP protocol over the connectionless UDP protocol?

3. How does TCP detect a lost packet? What actions are taken when a loss is detected? (4 points)

