Your Name _____

Sample Mid-term Exam #2
CptS/EE 455
October 26, 2015

Write your name on your paper first!

You may have one 8 1/2 x 11 sheet of notes (both sides, typewritten or handwritten). Otherwise, this is a **closed book, closed notes, closed neighbor** exam. Calculators are allowed. There are 11 numbered questions on 5 pages (3 sheets front and back). Make sure that you have them all. Answer the questions in the space provided. This is a **50 minute** exam, 10:10 – 11:00. Exams will be collected promptly at 11:00.

For best chance at partial credit, show all calculations.

1. IP Network addressing

If a host's IPv4 address and netmask are given as 13.2.0.64 and 255.255.252.0:

a) (5 pts) How many bits make up the subnet part of the address? Explain.

b) (5 pts) How many bits make up the host part of the address? Explain.

c) (5 pts) How many usable host addresses are there on this subnet? Explain.

d) (5 pts) is 13.2.3.137 a valid address on this same network? Why or why not?

2. DHCP is used to automatically configure networking on hosts.
a) (5 pts) In order to configure a host to operate on a network what 2 values must DHCP supply at a minimum?

b) (5 pts) What are two additional values that DHCP could (and often does) supply to host that is joining a network?

3a) (10 pts) Complete the table below to show how Dijkstra's link-state algorithm would build a routing table at node E for the following network. Note: the first row is **not** complete—be sure to fill in the missing entries.

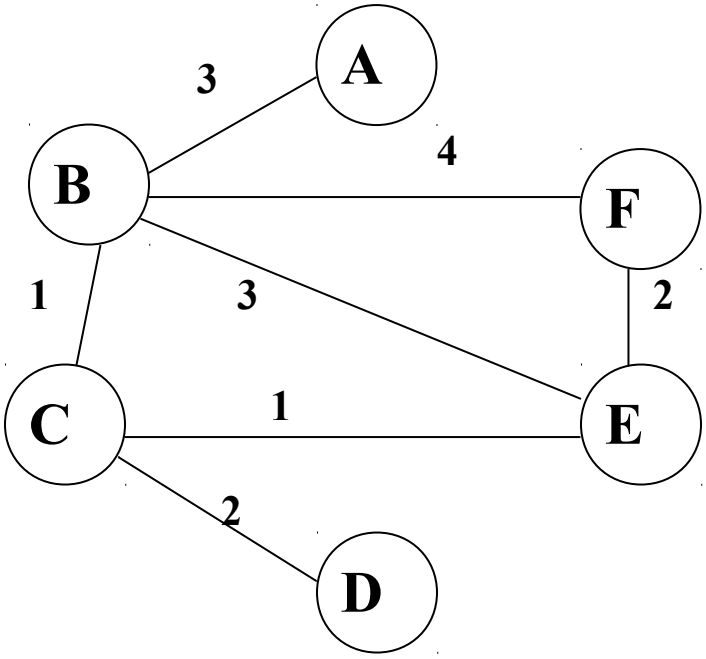


Table I: compute the distance and predecessor of each destination. At each step the N' column should contain the list of nodes whose final distance is known at that step.

Step	N'	D(A), p(A)	D(B), p(B)	D(C), p(C)	D(D), p(D)	D(F), p(F)
0	E		3, E		INF, -	
1						
2						
3						
4						
5						

3b) (5 pts) Based on your Table I, what path would be used for a packet traveling from node E to node A? (No credit if your answer is not correctly derived from the table you computed in part a of this question.)

4. (10 pts) Suppose that a router using a distance-vector algorithm currently holds the following routing table (not for the same network as the previous problem).

Destination	Next-hop	Cost
A	E	4
B	B	4
C	E	6
D	E	7
E	E	2

This router now receives the following from its neighbor, B, to which it is attached by a cost 4 link.

Destination	Cost
A	1
C	1
D	2
E	2

Fill in the table below to reflect this router's routing table after processing the update above.

Destination	Next-hop	Cost
A		
B		
C		
D		
E		

5. (5 pts) By definition *head-of-line blocking* occurs in a switch or router at
   a) output queues
   b) input queues
   c) switching fabrics
   d) memory

6. (5 pts) Number the types of router architectures below from 1, least performance, to 3, greatest performance.

_____ Memory-based

_____ Crossbar-based

_____ Bus-based

7. (10 pts) Consider a datagram network using 8-bit addresses. Suppose a router uses longest-prefix matching and has the following forwarding table. (Ignore the last column for a moment).

Prefix	Interface	# of hosts
00	0	
010	1	
01	2	
1	3	
10	4	64

a) (7 pts) in the 3rd column write the number of hosts that are reached via that interface (note that the prefixes cover overlapping address ranges and you have to consider that in your answers). Do not consider any of the addresses to be reserved and hence unusable.

b) (3 pts) Using the above forwarding table, what is the output interface for datagrams with the following source and destination addresses?

Source	Destination	Interface
0011 0001	0100 0010	
1000 0001	1111 0010	
1100 0100	0111 1000	

8. (10 pts) Describe the idea of *tunneling* and describe how it can be used to carry IPv6 traffic across portions of the Internet that are not IPv6 enabled. Things to consider: does an IPv6 router at the start of a tunnel have to know the IPv4 path to the IPv6 router at the end of the tunnel? Does it have to know the IPv4 address of the router at the end of the tunnel? Do the routers at both ends of the tunnel have to be aware that tunneling is being used?

9. (5 pts) Why do VC routers typically change the VC identifier in packets each time the packet passes through a switch?

10. (5 pts) Why would a datagram network generally suffer less disruption from a link outage than would a VC network?

11. (5 pts) Explain why broadcast or multicast using the controlled flooding techniques (either sequence-number controlled flooding or reverse path forwarding) use more network resources (i.e. more total bits are sent on the network) than do techniques based on spanning trees.