Networks and Distributed Systems	**Homework 3: IP**
CS3700 Spring 2015	**September 21, 2014**

This homework is due at the beginning of class on February 11, 2015 and is worth 1.5% of your grade.

Name: _____

CCIS Username: _____

Problem	Possible	Score
1	15	
2	20	
3	25	
4	15	
5	25	
6	10	
Total	110	

1a. For the following IP addresses, give their class (A, B, or C) and their representation in binary: 129.10.115.10, 4.3.2.129, 220.33.9.21. (5 pts)

1b. The binary representation of 128.42.5.4 is shown below.

10000000 00101010 00000101 00000100

If the subnet mask is 255.255.248.0, label the bits that correspond to the (a) class prefix, (b) the network number, (c) the subnet number, and (d) the host number. (10 pts)

2a. Convert the following IP/subnet representations of networks to the equivalent CIDR representation. If the network cannot be represented in CIDR, briefly explain why.

(i) 128.42.0.0/255.255.0.0

(ii) 192.168.0.0/255.255.224.0

(iii) 172.10.12.0/255.255.253.0

(iv) 64.0.0.0/192.0.0.0 (10 pts)

2b. Suppose that you have been allocated 173.98.112.0/20, and you wish to divide your address space equally into four parts. What are the CIDR (Classless Interdomain Routing) representations of these four parts? (10 pts)

3a. Consider the following data bits that correspond to 2-byte words:

1001 1111 0101 0011
1001 1111 1100 0011

Compute the Internet Checksum for the data. (10 pts)

3b. If the data bits and checksum are transmitted in a packet, then what is the value of the sum computed at the receiver assuming there were no bit errors in transmission? (5 pts)

3c. What is the value of the checksum computed at the receiver if there is an error in the third bit of the transmitted data and an error in the 12th bit of the transmitted checksum? Comment briefly on the result. (5 pts)

3d. What is the value of the checksum computed at the receiver if there is an error in the fifth bit of the transmitted data and an error in the fifth bit of the transmitted checksum? Comment briefly on the result. (5 pts)

4. Suppose you receive the following series of IP packets at a destination host (be sure to remember that the length field in the packet *includes the header*, and the offset is specified as the number of 8-byte blocks from the beginning of the data in the original IP datagram):

#	ID	Flags	Offset	Total Length
1	0xdb7a	-	370	300
2	0x7823	MF	370	1500
3	0x992a	MF	185	300
4	0x45a9	-	0	1500
5	0x7823	MF	0	1500
6	0x992a	MF	0	1500
7	0xdb7a	MF	185	1500
8	0x9ffb	-	200	1500
9	0xdb7a	MF	0	1500
10	0x33aa	-	0	1500

What packet IDs have you completely received, and how many total data bytes are in each of the completely received packets? For this problem, you can assume that all IP packets have no options. (15 pts)

5a. Why does the Offset field in the IP header measure the offset in 8-byte units? (Hint: Recall that the Offset field is 13 bits long.) (5 pts)

5b. Some signaling errors can cause entire ranges of bits in a packet to be overwritten by all 0s or all 1s. Suppose all the bits in the packet including the Internet checksum are overwritten. Could a packet with all 0s or all 1s be a legal IPv4 packet? Will the Internet checksum catch that error? Why or why not? (10 pts)

5c. IP currently uses 32-bit addresses. If we could redesign IP to use the 6-byte MAC address instead of the 32-bit address, would we be able to eliminate the need for ARP? Explain why or why not. (10 pts)

6. You are a router, and one of your outgoing links has an MTU of 1000 bytes (ignore layer 2 headers). You receive the following packets that all need to be sent out over this link:

#	ID	Flags	Offset	Total Length
0	0x1930	-	0	1000
1	0x92ad	-	0	3000
2	0x944f	DF	0	1000
3	0xaa22	-	185	1001
4	0x78a1	MF	370	1500
5	0x3ac8	DF	0	1500

Fill in the table below with the header fields of the packets that you send out (you may not need all of the rows). The first packet has been completed for you. (10 pts)

#	ID	Flags	Offset	Total Length
1	0x1930	-	0	1000
2				
3				
4				
5				
6				
7				
8				
9				
10				