CS 3251: Exam 1 **Name:**_____

Instructor: Dr. Clark February 14, 2012

CS 3251
Spring 2012 - Midterm Exam

Problem	Possible	Score
1	20	
2	20	
3	20	
4	20	
5	20	
Total	100	

This test is closed book and closed notes. Answer the questions in the space provided. When answering questions, please state any and all assumptions you are making.

Part 1: Packets and Circuits (20 points)

The Internet we use today is primarily based on a packet switched, datagram service rather than a circuit switched, connection-oriented service.

1. **(8 pts)** Why is packet switching preferred in the Internet rather than circuit switching? Describe the advantages and disadvantages of each.

2. **(6 pts)** In packet switched networks, describe the tradeoffs for larger packet sizes vs smaller packet sizes.

3. **(6 pts)** In the Internet architecture, the network layer is often referred to as the waist of the IP hourglass with a single network layer protocol but multiple protocols at other layers. Explain why this has happened. What is different about this layer vs other layers?

Part 2: Multiplexing (20 points)

1. **(10 pts)** What is meant by the term ”protocol multiplexing”? What purpose does it serve?

2. **(10 pts)** For each layer of the (five layer) protocol stack, give an example of how multiplexing is commonly performed today.

Part 3: Network Programming (20 points)

1. **(5 pts)** What is meant by the term "network byte ordering"? Why is this important for network application development?

2. **(5 pts)** What distinguishes a "client" from a "server" in network programming?

3. **(10 pts)** Consider the following UDP application pseudo-code fragments. Imagine that the client has successfully executed the the *sendto()* call and is now blocked **forever** on the *recvfrom()* call. List several possible explanations for this situation. Explain your answers for full credit.

```
// Client
  ....

  sendto();
  recvfrom();
```

```
// Server
  ....

  while (TRUE) {
      recvfrom();
      sendto();
  }
```

Part 4: Application Protocols (20 points)

1. **(8 pts)** SMTP is limited to transferring only simple, 7-bit ASCII text files. What is the specific aspect of the SMTP protocol design that prevents us from using it for mail messages that contain arbitrary data?

2. **(6 pts)** How do we overcome this limitation of SMTP in Internet mail today?

3. **(6 pts)** What is different about HTTP that it doesn't have this problem? Be specific about the approach used by the HTTP designers as compared to the design of SMTP.

Part 5: The Web and Such (20 points)

1. **(8 pts)** HTTP V1.1 supports *persistent connections* with *pipelining*. What do these terms mean? How does it improve HTTP performance? (Be specific, especially with respect to the impact on other protocols we have discussed)

2. **(6 pts)** What specific role does SIP play in providing the VoIP service?

3. **(6 pts)** Describe how the DNS can be used as part of a web server load balancing architecture?