

**Department of Electrical and Computer Engineering  
University of Puerto Rico  
Mayaguez Campus**

**ICOM 6115 – Computer Networks and the WWW  
Fall 2002  
Final Exam**

**Name:** \_\_\_\_\_

**Student Number:** \_\_\_\_\_

**Section:** \_\_\_\_\_

**Instructions:**

1. Write your name on all pages of this exam now!
2. You have from 10:00 AM until 4:30 PM to complete this exam. Use your time wisely. Do not spend too much time on a problem, when you can work on others.
3. There are six problems for a maximum score of 110 points, but your score will be averaged using 100 points. Complete as many problems as you can, and earn as many points as possible
4. Read each question carefully, and show all the work you used to generate your answer.
5. To receive partial credit, you must show all the work you used to generate your answer.

**GOOD LUCK!**

## Scores

1	/20
2	/20
3	/20
4	/20
5	/20
6	/10
Total	/100

**Problem 1. (20 points) Discussion**

Answer the following two questions. Justify your answer with solid arguments.

- a) (10 pts) Explain the advantages and disadvantages of using TCP vs UDP to implement an Internet Radio Application?

Problem 1 (continuation)

- b) (10 pts) What are advantages and disadvantages that RMI has over straight Java Sockets for client-server programming?

**Problem 2 (20 points) Understanding of Delay x Bandwidth**

Hosts A and B are each connected to a switch S. Each host has a 10Mbps link to the switch, and the propagation delay of the switch is 20 microsecs. The queuing delay of the switch is 35microsecs. Calculate the total time to transmit 10KB from host A to B as follow:

- a) (10 pts) Assuming the data is sent in a single packet (assume no headers)

**Problem 2 (20 points) Continuation**

- b) (10 pts) Assuming the data is sent in two consecutive 5KB packets sent one right after the other (assume no headers)

**Problem 3. (20 points) Understanding Routing and Forwarding**

Suppose a router R1 has built up the following routing table.

<b>SubnetNumber</b>	<b>SubnetMask</b>	<b>Interface</b>
128.96.39.0	255.255.255.128	Interface 0
128.96.39.128	255.255.255.128	Interface 1
128.96.40.0	255.255.255.128	R2
192.4.153.1	255.255.255.192	R3
<default>	-	R4

The router can deliver packets directly over interfaces 0 and 1, or it can forward packets to routers R2, R3 or R4. Describe what the router does when it receives a packet addressed to hosts with each of the following IP addresses:

a) (4 pts) 128.96.39.10

b) (4 pts) 128.96.40.12

**Problem 3 (Continuation)**

c) (4 pts) 128.96.40.151

d) (4 pts) 192.4.153.17

e) (4 pts) 192.4.153.90



**Problem 4. (20 points) Understanding of Socket Programming**

In this exercise, you will develop a Java server application called `StatNet`. This application will provide a service for computing simple statistics. The following operations will be supported:

1. Addition – Computes the sum of a group of integer numbers.
  - a. Parameter: Java array of int
  - b. Returns: Java int storing the sum of the parameters.
2. Average – Computes the average of a group of integer numbers.
  - a. Parameter: Java array of int
  - b. Returns: Java double storing the average of the parameters.
3. Standard Deviation – Computes the standard deviation of the parameters
  - a. Parameter: Java array of int
  - b. Returns: Java double storing the standard deviation of the parameters.

You will implement your solution as a Java class called `StatNet.java`. The class is not multi-threaded, but rather an iterative server. The class must have functions implementing the operations above mentioned. Communications must be handled via Java sockets. The class must use Java short values to indicate the operations mentioned above (1, 2, and 3), plus the requests to open and close a session for service (like in project 1).

**Problem 4 (Continuation)**

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**Problem 5 (20 Points) Understanding of Java RMI**

In this exercise, you will re-implement the server application `StatNet`, but this time using Java RMI. You can visit the web site: <http://java.sun.com/rmi/> to access a tutorial on RMI. Your solution will be done as follows:

- a) (10 pts) Write a Java interface `StatNet.java` that has the prototypes of the methods expressing the operations `Addition`, `Average` and `Standard Deviation`, as defined in exercise 4. This interface must extend the Java RMI `Remote` interface and comply with all RMI exception management requirements.

**Problem 5. (Continuation)**

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- b) (10 pts) Write a Java class `StatNetImp.java` that implements the methods in the interface `StatNet.java`. This class must extend the Java RMI `UnicastRemoteObject` class, and also implement the interface `StatNet.java`. In addition, the class `StatNetImp.java` handle the process of creating the object instance and registering with the RMI registry under the name “StatNetService”.

**Problem 5 (Continuation)**

**Problem 6 (10 pts) Class Evaluation**

What aspect of the class you liked the most? (5 pts)

What aspect of the class you disliked the most? (5 pts)