Ser321 Review Questions for: Sockets and Threads

References:
ClassNotes sections on Threads and Sockets (only the Java sections)
Chapters 3, 6, and 7 of “Java Network Programming and Distributed Computing” text
by Reilly&Reilly
(available via the internet by searching for the pdf version of the book)
Oracle Java tutorial on networking with sockets. See:
https://docs.oracle.com/javase/tutorial/networking/sockets/index.html
Oracle Java tutorial on networking basics. See:
https://docs.oracle.com/javase/tutorial/networking/overview/networking.html
Oracle Java tutorial on concurrency covers threading basics in Java. See:
https://docs.oracle.com/javase/tutorial/essential/concurrency/index.html

Which of the following is/are not Java Thread states?
   a. new
   b. runnable
   c. running
   d. interruptable

Suppose I create a data structure, such as a library of books. I would do this with two classes:
BookLibrary and Book. Suppose also that an object of the class BookLibrary (called myFictionBooks)
is shared by multiple threads to give several threads access to the library. This may be done by a server
in connecting with different clients of the library. For example, I may have an instance of the
BookLibrary class named myFictionBooks that is being shared by a check-out thread and by a leisure
reading thread. How do I determine which, if any, of the methods of the class BookLibrary should
have the synchronized modifier? Select the best answer:
   1. None of the public methods need to be synchronized
   2. All of the public methods need to be synchronized
   3. If any of the public methods change the data in a BookLibrary instance then all public methods
      should be synchronized.
   4. Only the public methods that modify the data in a BookLibrary instance need to be
      synchronized.
   5. Only the public methods that read the data in a BookLibrary instance need to be synchronized.
   6. All of the above.

Sockets. Consider the items below, which describe characteristics of TCP (transmission control
protocol) socket communications between a client and server. For each item, indicate whether it better
describes Stream-Based (TCP/IP) sockets or Datagram sockets.
   1. Transmissions are independent and are not part of a session.
   2. Session-oriented communications. Clients and server connect for multiple transmissions.
   3. The size of data that can be communicated in a single transmission is not limited.
   4. Error checking occurs for each transmission to assure the information received matches what
      was sent.
5. Multiple transmissions are guaranteed to arrive in the same order they were sent.
6. Data size of a single transmission is limited to 32K bytes.

**Sockets, Distributed Applications.** A URL (Uniform Resource Locator) is used by several Internet applications to identify an Internet resource. A URL includes the following parts;

1. Anchor
2. Scheme (protocol)
3. File or path
4. Port
5. Internet address

For the following URL, identify each of the parts above. Write the appropriate part (substring) of the URL below:

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**Threaded socket servers and their clients.** Suppose we have a threaded socket server, such as a web server. Read the two analogies (similar situations in everyday life) below - (1) and (2). Which of the systems described below is closest to the implementation approach discussed in class for stream-based socket servers, such as an http Web Server, or the Waypoint server from Assignment 5?

1. **Supermarket.** When checking out in a supermarket (grocery store), the customer is presented with some number of lines (queues), which are typically numbered, similar to port numbers. Each queue has a separate cashier who provides the checkout service to the customer. The customer selects the “best” queue to enter. Consider each person to be a separate thread object -- some thread objects are of class *Customer* and others are of class *CheckOutClerk*, for example.

2. **Automobile Service Center.** When your automobile needs service, you as a customer contact the repair facility's service advisor. The service advisor manages a group of mechanics who can perform maintenance services on your vehicle. The service advisor meets customers requesting service, records what services are needed and then dispatches the automobile to the appropriate mechanic to have service performed. Consider each person to be a separate thread object -- some are of class *Customer*, another is of class *ServiceAdvisor*, and others are of class *Mechanic*, for example.

When a client and server communicate via a socket-based connection, their communication is carried out according to a protocol. What is a protocol, and what must be specified when defining a protocol? Name some widely used stream-based socket protocols.

In class we made the distinction between an IP (internet protocol) address, for example 129.219.151.15 and a domain name, such as quay.poly.asu.edu. When reading both an IP and a domain name from left to right, one goes from more specific to less specific and the other goes from less specific to more specific. Which is which?

What service converts from a domain name to a IP address? Which topics covered in this course would be used if you were asked to implement one of these servers (in Java, for instance)?

**Model, View, Control (MVC)** is a common pattern for developing applications that are distributed and/or based on a graphical/windowed user interface. Using either the CalculateLibJsonRPC or the
GroupJsonRPC example. Identify which classes would be considered as Model, which as View, and which as Control. In one or two sentences each, characterize the terms Model, View, and Control.

When using TCP/IP sockets in Java, we use an input stream and an output stream. Explain what these streams are, and how they are used to communicate in a distributed application.