Name: __________________________________________________________

Andrew ID: ______________________________________________________

**Total time:** 50 minutes

**Instructions:**

- Write your answers in the spaces provided below the problems. If you make a mess, clearly indicate your final answers.
- This quiz has 7 questions over 6 pages, for a total of 20 points.
- Keep up with time.

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1. Answer the following questions by selecting **True** or **False**:

   (a) **True** / **False**  RPC allows passing parameters only by value.

   (b) **True** / **False**  Marshalling and un-marshalling processes are done in the stubs and skeletons of RPC.

   (c) **True** / **False**  A distributed file system can be built without incorporating a naming service.

   (d) **True** / **False**  The Bellman-Ford algorithm is essentially a naming service protocol for locating machines over the Internet.

   (e) **True** / **False**  Bellman-Ford and linear (NOT logarithmic) Chord use peer-to-peer architectures.

   (f) **True** / **False**  Broadcasting is an effective naming service especially in WAN settings.

   (g) **True** / **False**  An approach to locating mobile entities is to use forwarding pointers, whereby an entity moving from location A to location B can leave behind a server stub (or a skeleton) to its new location at B.

   (h) **True** / **False**  No fault-tolerance measures need to be taken in RPC if it is layered on top of TCP.

   (i) **True** / **False**  The at-least-once semantic in RPC can only be used with idempotent operations.

   (j) **True** / **False**  Latency is a measure of throughput.

2. How can heterogeneity be masked in distributed systems? Explain.
Mock Quiz continues on the next page(s)
3. What is the difference between *layered* and *tiered* architectures? Give an example of when you would use a layered architecture, but not a tiered one?

2pts 4. Assume you have been asked to design and implement a distributed system for video processing, which requires high Quality-of-Service. Would you use TCP or UDP for your middleware implementation? Justify your answer.
5. What is the weakest RPC semantic (i.e., *exactly-once*, *at-most-once*, or *at-least-once*) that can be used for the following scenario: Requesting taxi from an application online (e.g. *Uber*). Discuss.

6. Why are marshaling and unmarshaling important in exchanging data between communicating entities in a distributed system? What is the method that is usually used to enable any two computers to exchange binary data values? List at least one approach that is widely used to achieve that.
7. If a mobile computer is to remain accessible to clients when it moves between local networks and wireless networks, it must retain a single IP number. However, IP routing is subnet-based. Subnets are at fixed locations, and the correct routing of packets to them depends upon their positions on the network. Discuss a way of how location transparency can be achieved in such an environment (i.e., IP communication continues normally when a mobile computer moves between subnets at different locations).