

2014 QE – Distributed systems

1. As the Internet becomes prevalent and advanced, many distributed applications and systems adopt to cloud computing. One of key design considerations in distributed systems is transparency. Describe how network, location, and migration transparency can be achieved in a cloud computing environment. Assume that a user uses both a smart phone and a PC. (50pt)
2. A system is considered *faulty* once its behavior is no longer consistent with its specification. Replication is a typical way to support fault tolerance. Describe how many replicas should be provided to support  $k$  fault-tolerance for Byzantine failure and fail-stop failure and explain why. (20pt)
3. Distributed transactions refer to flat or nested transactions that access data managed by multiple servers. Due to the atomicity property of transactions requires that either all of the servers involved commit the transaction or all of them abort the transaction. What is the most popular protocol to support this and explain its semantics. (30pt)