

## Exam Internet of Things - 201700075

The exam consists of the questions below, all of equal weight. Be concise and to the point, all questions can be answered in less than 10 lines. Please be aware that questions have sub-questions, numbered by a letter. You have 90 minutes for this test.

This is an open book exam, which means that the reading materials that were provided are allowed to use. No electronic devices are allowed.

Good luck!

1. The Internet of Things is a broad term.
  - a. Give a definition in one line of the Internet of Things (IoT).
  - b. What are the main functional elements in an IoT system?
  - c. What are the differences between a Wireless Sensor Network and an IoT system? How do they relate to each other?
  
2. Multi-hop communication is often used in IoT systems.
  - a. Using multiple communication hops instead of a single hop affects the overall energy consumption. What are the tradeoffs regarding energy consumption?
  - b. When would a star-network be more energy efficient than a multi-hop network, and vice versa?
  - c. Describe other advantages or disadvantages of multi-hop communications, for example, in terms of performance (latency, throughput), reliability, and security.
  
3. A common classification in routing protocols is 1) pro-active and 2) on-demand.
  - a. What is the major difference in these two types of protocols?
  - b. What type of protocols fit in general more to a wireless sensing system for structural monitoring (e.g. a bridge)?
  - c. What are the major characteristics of the network and traffic that support that choice (mention at least two arguments)?
  
4. Data analytics is the most important element related to Big data.
  - a. What are the 4 major differences of the "traditional" Big Data concepts when applied to IoT?
  - b. What are the major challenges with IoT sensor data analytics?

5. Blockchain and IOTA are methods that could enable smart contracts in the IoT.
  - a. Why are smart contracts superior than traditional contracts?
  - b. What are the main differences between IOTA and Blockchain?
  - c. What is the difference between genesis and tip in IOTA?
  
6. Machine Learning and IoT.
  - a. "A computer program is said to learn from experience E with respect to some task T and some performance P, if its performance on T, as measured by P, improve with experience E". Define an IoT research question which can be solved with Machine Learning (like the groundwater monitoring from the lecture). What is the E, T, P in the IoT research question?
  - b. What is the difference between supervised and unsupervised Machine Learning?
  - c. How is the k-nearest neighbor algorithm different from k-means clustering?