



ECE6615: SENSOR NETWORKS

SPRING 2010; FINAL EXAM

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2:50pm - 5:40pm

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- * PUT THE SAME CODEWORD NEXT TO YOUR NAME!!!
- * THIS IS AN OPEN BOOK EXAM (EVERYTHING ALLOWED EXCEPT LAPTOPS AND CELL PHONES)
- * DURATION is 170 MINUTES
- * ANSWER THE QUESTIONS RIGHT TO THE POINT; AVOID LONG EXPLANATIONS!!

QUESTION 1. (25 points; each question with the same weight)

- a) What are the factors that can affect the propagation of EM waves in the soil medium?
- b) What are the advantages of the MI communication compared with the EM waves in soil medium?
- c) What are the disadvantages of the MI communication for WUSNs?
- d) Why the channel characteristics in underground tunnels are different from those of the terrestrial channel?
- e) How many models did we learn to characterize the wireless channel in tunnels? Explain their Pros and Cons.

QUESTION 2. (20 points; each question with the same weight)

- a) Why can't we use radio waves or optical waves in underwater sensor networks?
- b) What is the main difference in the optimal packet size definition for delay-insensitive and delay-sensitive applications for Distributed Routing Algorithms for Delay-Insensitive and Delay-Sensitive applications of UWSNs?
- c) In the same case, why is the information sent in trains of packets instead of single packets?
- d) How are the underwater physical channel effects captured in the above routing algorithms?

QUESTION 3. (25 points; each question with the same weight)

- a) Why can't we use TDMA-based MAC protocols in UWSNs? And FDMA? And CSMA?
- b) How does the distributed CDMA MAC protocol for UWSNs differ from classical CDMA systems?
- c) In the Distributed CDMA MAC protocol for UWSN, what are the Multiuser Access Interference (MAI) values that nodes periodically exchange? What are they used for in our protocol?
- d) How are the underwater physical channel effects captured in this Distributed MAC protocol?

QUESTION 4 (30 points; each question with the same weight)

- a) What are the benefits deriving from the application of In Network Processing techniques in Wireless Multimedia Sensor Networks?
- b) What are the main differences between Multimedia traffic and Data traffic and how do they affect the design of a Wireless Sensor Network?
- c) Describe how SPEED provides routing services to delay-sensitive flows.
- d) Explain how MMSPEED differentiates among flows with different reliability requirements.
- e) What are the benefits and drawbacks of Ultra Wide Band technology when applied to WMSNs?
- f) What are the Hop-by-Hop QoS contracts and where are they defined?