

ECE8863: COGNITIVE RADIO NETWORKS
Spring 2013

MIDTERM EXAM: MARCH 13, 2013

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- * PUT A CODEWORD NEXT TO YOUR NAME!!!
- * OPEN BOOK EXAM (EVERYTHING ALLOWED EXCEPT LAPTOPS AND CELL PHONES)
- * DURATION 75 MINUTES
- * ANSWER THE QUESTIONS RIGHT TO THE POINT;
- * AVOID LONG EXPLANATIONS; COUPLE SENTENCES WILL BE ENOUGH AS LONG AS THEY ARE CORRECT!! GIVE SHORT ANSWERS!!!

QUESTION 1. (35 points/ 5 points each)

- a) What are the problems of transmitter detection techniques?
- b) How can you solve the Receiver Uncertainty problem and Shadowing/Multipath problems in spectrum sensing techniques?
- c) Why is the spectrum sensing eliminated from TV white spaces? How is the spectrum sensing problem solved for TV white spaces?
- d) Although cyclostationary feature detection has all the advantages for sensing, researchers still try to find new sensing techniques. Why?
- e) What are the advantages of cyclostationary feature detection compared to match filter detection?
- f) What are the shortcomings of compressed spectrum sensing?
- g) What was the problem with the Interference Temperature Management scheme? Why was it cancelled from the IEEE 802.22 standards?

1

QUESTION 2. (20 points; 5 points each)

- a) What are the gains (give 4 reasons) of cooperative sensing and downsides (give 2 reasons)?
- b) What are the differences between parallel fusion and game theoretic cooperation models?
- c) What types of cooperative overhead can be affected by user selection & why?
- d) List 3 cases where cooperative sensing is not a good choice over individual/local spectrum sensing.

QUESTION 3. (20 points; 5 points each)

- a) In the spectrum decision framework for long term quality variations and PU appearance cases we go back to Admission Control and for short term fluctuations we go back to spectrum sharing only. Why? What is the gain of this? Why don't we go to admission control in both cases?
- b) What is the difference between Single and Multiple User Selection in Spectrum Decision?
- c) What are the advantages/disadvantages of multiple spectrum decision over single spectrum decision?
- d) What are the objectives of the Spectrum Decision framework of Lee/Akyildiz for Real-Time traffic and Best Effort traffic?

QUESTION 4. (25 points)

- a) What is the significance of Game Theory to Dynamic Spectrum Sharing?
- b) Why is the Fairness Bargaining with Feed Poverty considered to be optimal?
- c) What is a double auction pricing game? How does it differ from the one dimensional auctioning game?
- d) Why is One Dimensional Based Auction with Pricing based on SINR or Power?
- e) What are the major differences between the papers: Auction based Spectrum Sharing and Interference Compensation Based Spectrum Sharing although both papers are from the same authors, Huang et al.?

2