Homework IV (due: 04/18/2017)

CIS 9590 Ad Hoc Networks

Name ______________________________ Student Number _____________________________

1. (Coverage and Exposure Problems)
Given four sensors (1, 3), (2, 2), (4, 1), and (5, 6) in a 7 by 7 square with four corners: (0, 0), (0, 7), (7, 0), and (7, 7). Find the corresponding Voronoi diagram and Delaunay triangulation. Suppose a path starts from the left side of the square to the right side of the square. Find the maximal breach path and maximal support path, respectively. Show all your work on a diagram and calculate the corresponding maximum breach value and minimum support value.

2. (LEACH)
Suppose P = 0.1 (percentage of clusterhead in each round) and |G| = 20 (the total number of sensors). Write a probability clusterhead selection program for LEACH and show results of 20 rounds consecutive execution by listing cluster IDs selected at each round. Attached your programming code as well.

3. (Local vs. GlobalCoverage in Mobile Charging)
Consider the setting shown on pages 152 and 153 in the third set of classnotes. Show that RegionalCoverage (page 160) is equivalent to GlobalCoverage (page 158). Once you provide a high level proof, use the example shown on page 152 to demonstrate the equivalence of these two approaches.

4. (Utility-base Routing)
Consider a 5-node graph with the following cost/reliability distribution for each link: link (S, 1): 2.5/0.75, link (S, 2): 4/1, link (2, d): 3/0.8, link (1, d): 3/0.9, and link (1, 2): 1/0.7. (1) Find the best utility path from s to d with benefit v=15 and the best utility path from s to d with benefit v=35, respectively. (2) Find all the possible best utility paths for different benefit values.

5. (DC Subway System)
The Washington, DC subway system charges fees based on travelling distance. For example, a passenger enters station A, stays there for X (say, 10) hours, and exits station B. The charge is proportion to the distance between A and B and is irrelevant to X. If a passenger enters and exits the same station, $1.5 is charged. (1) What are potential flaws of the system? Hint: consider buying two tickets to break the system. (2) One possible solution is to limit X to 4 (as in Nanjing, China). Is this solution flawless?