CSE 4215 :: Lab 4

Issued March 29, 2012; due April 16, 2012.
WARNING: **No extensions will be granted.**

1. For a cellular telephone system with reuse factor 4, sketch two neighboring clusters of 4 cells. If the radius of one cell (defined as the distance from the center of the cell to one of its vertices) is 500 m, find the shortest distance between any pair of cells with the same frequencies in your sketch.

2. Repeat question 1 for a cluster of 7 cells.

3. Considering questions 1 and 2, is that the shortest possible distance, or would you get a different answer if you made a different sketch? Discuss.

4. For the "flower-type" reuse pattern with 7 cells, notice that any path from the central cell to the edge crosses exactly one cell (call this the "reuse radius", so that the reuse pattern with 7 cells has a reuse radius of 1). Generalize this pattern to reuse radii of 2, 3, 4 … cells. What are the resulting re-use factors? Discuss with examples.

5. For reuse radii of 1, 2, …, 8, obtain the distance d from the center to the edge of the cluster if the radius of the cell is 500m. Plot d two ways: as a function of reuse radius, and as a function of reuse factor. Can you identify a general relationship between d and the reuse factor (i.e., is it log, linear, polynomial …)?

6. Consider the inverse problem: if d is fixed at 1 km, what is the size of the cell as a function of re-use radius and re-use factor? (If you can't solve this problem in closed form, describe how to solve it numerically.)

7. Consider a cellular system using CDMA, with a number of chips n = 20. Plot the probability of error as a function of the number of users, from 2 to 100 users.