

# CSE590 Fall 2009 Wireless and Mobile Networks

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Due **September 15th** before class. Each problem, unless specified otherwise, has a maximum of 10 points. (i) You write down the solution clearly. If we can not recognize your writing then you may lose points. (ii) Avoid unnecessary details.

## Homework 1

1. In a mobile communication network, the minimum required signal-to-noise ratio is 12dB. The background noise at the frequency of operation is -115dBm. If the transmit power is 10W, transmitter antenna gain is 3dBi, the receiver antenna gain is 2dBi, the frequency of operation is 800MHz, and the base station and mobile antenna heights are 100m and 1.4m, respectively. Determine the maximum in building penetration loss that is acceptable for a base station with a coverage of 5km if the following path loss models are used.
  - (a) Free space path loss model.
  - (b) Two-ray path loss model.

[The free space path loss model and two-ray path loss model are in the handouts. Check course webpage for the definition of dB.]

2. The inter-arrival times of multipath components can be modeled as either a constant or as a random process. In many cases, the inter-arrival times are modeled as samples from an exponential distribution (path arrivals are from a Poisson process). If the variance of the exponential distribution used to model one such radio channel is  $4ns^2$ , what is the average arrival time of the process? Use a software tool (Matlab for example) to generate 100 samples of the inter-arrival times and plot arrival times of the multipath components. Compute the average for your simulations.

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