Department of Electrical Engineering

EE 764: Wireless and Mobile Communications (Spring 2018)

Course Instructor: Prof. Abhay Karandikar

Simulation Assignment 4

Due Date: 6th April, 2018

Instructions:

- *Use either MATLAB or SciLab for simulations in this assignment.*
- **Please Note: This assignment is NOT a group assignment and has to be submitted by each student individually.**
- Submit a tarball/zip file with the following files:
  1. Plots in the form of **SEMILOG** graphs wherever asked for.
  2. Discussion of results and your inferences in the form of a PDF file.
  3. Simulation code files for assignment with detailed comments.
- The filename of the uploaded file should be in the format : RollNumber_assign4.

Simulation Settings: Consider a CDMA cellular system as shown in Figure 1. Base Stations (BSs) are located at the center of each hexagonal cell with cell radius of R_c = 500 m. We refer to the cell in the center as the reference cell, which is surrounded by six cells forming the first tier. Each cell has M Mobile Stations (MSs) which are randomly and uniformly distributed. We consider an uplink scenario where every MS transmits a BPSK signal. We assume that there is a tight power control at MSs. Therefore, the power P received from any MS at its serving BS is -60 dBm and the power received at any other BS has a path loss exponent $\gamma = 3.5$. We also assume an AWGN channel with noise power $N_0 = -90$ dBm. For each MS, a wide band random sequence of length 512 is generated with each component being ± 1 with equal probability. These sequences are assumed to be known to their serving BSs.

1. **Evaluation of BER for a single cell scenario**
   In this scenario, consider only the reference cell. Increase the number of MSs M in the reference cell and measure average Bit Error Rate (BER) of an MS. Vary the number of MSs in steps of 10 upto 100 and plot the variation of M v/s BER for 1000 iterations. Also plot the variation of M v/s Signal to Interference and Noise Ratio (SINR).

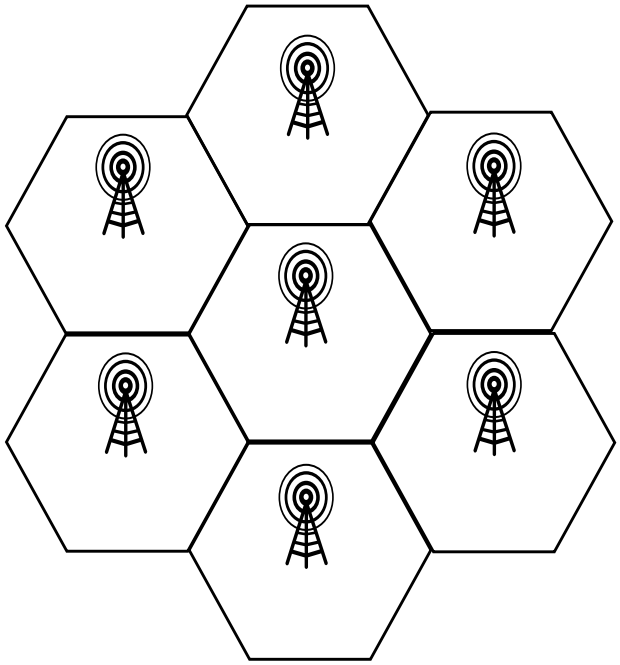

Figure 1: Cellular System

2. **Evaluation of BER for multi-cell scenario**
   In this scenario, we consider the cellular system as shown in Fig. 1. Repeat the same process as described in problem 1.

Find the capacity of a CDMA system for which BER is 10^{-3} for both the scenarios.