Quiz 3

Total Marks: 5

Note: In case you are unsure about any parameter(s) and parameter value(s), please use your best judgement to assume suitable variables/values for them.

1. Let us consider a single-cell, circular in size, of radius R with a BS located at the center, transmitting with a power P. Let users arrive into this cell with a Poisson arrival process in time with intensity λ_A users per second. When they arrive, they are located uniformly in space in the cell, with intensity λ_U per meter square. Assume that each user has σ bits to transmit, and after service, they leave the network.

   (a) Write the expression for the cell-load in this case. With $P = 10$ dB, path-loss exponent of 2, a transmit frequency of 2.3 GHz, bandwidth of 20 MHz, $R = 1000$ m, $\lambda_A = 1$ per second, $\lambda_U = 1$ per meter square, and $\sigma = 2$ kb, find out the value of average cell load. **[2 points]**

   (b) Write the expression for average number of active users in this case and evaluate it for the parameters above. **[1 points]**

   (c) Now consider that the bandwidth is divided equally among the average number of active users (assume this number remains constant). Write the expression for average throughput in the cell and calculate it for the above parameters. **[2 points]**