ECE6604 Personal & Mobile Communications

Assignment #5

Date Assigned: March 4, 2010

Date Due: March 16, 2010

1) Text 2.26

2) Consider a system where the area mean signal strength is described by the equation

$$\Omega_{p\ (\mathrm{dBm})}(d) = \mu_{\Omega_{p}\ (\mathrm{dBm})}(d_o) - 10\beta \log_{10}(d/d_o) + \epsilon_{(\mathrm{dB})} \quad (\mathrm{dBm})$$

where $d_o = 1$ m, $\mu_{\Omega_{p}\ (\mathrm{dBm})}(d_o) = 0$ dBm, $\beta = 3.5$, and $\epsilon_{(\mathrm{dB})}$ is a zero-mean Gaussian random variable with standard deviation $\sigma_\Omega = 8$ dB.

a) Suppose that a mobile station is 1 km from its serving base-station and at distances 3 km and 4 km from two co-channel base-stations. Using the Fenton Wilkinson method derive the probability density function of the received interference power I in decibel units.

a) What is the probability density function of the received carrier-to-interference ratio C/I in decibel units.

3) Text problem 3.4

4) For the case of a Rician faded desired signal and a single Rayleigh faded interferer, show that the co-channel interference outage probability is given by

$$O_I = \frac{\lambda_{\mathrm{th}}}{\lambda_{\mathrm{th}} + A_1} \exp\left\{-\frac{K A_1}{\lambda_{\mathrm{th}} + A_1}\right\} \ ,$$

where K is the Rice factor of the desired signal, $A_1 = \Omega_0/(K+1)\Omega_1$, and $\Omega_k = \mathrm{E}[s_k]$ where $s_i = \alpha_i^2$ and α_i^2 is the squared-envelope.

5) Text problem 4.5