KFUPM - COMPUTER ENGINEERING DEPARTMENT

COE-543 – Mobile Computing and Wireless Networks

Quiz # 3 – Due Mon April 12th, 2010 – class time.

Student Name:
Student Number:

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1) (10 points) Assume that it is desired to deploy analog FM AMPS system with half band of 15 kHz rather than the existing 30 kHz. Also assume that in analog FM, the signal-to-interference requirement is inversely proportional to the square of the bandwidth (4 times increase in SIR for dividing the band into two).

a) What is the required SIR in dB for the 15 MHz channel if the required SIR for the 30 kHz systems is 18 dB.

b) Determine the frequency reuse factor *N* needed for the implementation of the 15 kHz per user analog cellular system.

c) If a service provider had a 12.5 MHz band in each direction (up-link and down-link) and it would install 30 antenna sites to provide its service, what would be the maximum number of simultaneous users (i.e. capacity) that the system could support in all cells. Neglect the channels that are used for control signaling.

d) If we use the same antenna sites but for a 30 kHz per channel system with $N = 7$ (instead of the 15 kHz system) what would be the capacity of the new system.

Assume path loss exponent equal to 4.

2) (20 points) Assume that STC had an initial deployment of GSM in the Eastern province with a frequency reuse pattern of $N = 12$. Due to increase in the demand for cellular services, STC engineers are to expand the system capacity using the reuse partitioning approach.

a) Assuming the new overlay network will use $N = 7$, compute the number of channels (belonging to the underlay and overlay networks) per cell. What is the capacity increase relative to the initial deployment?

b) Assume that due to further increase in demand, STC plans to increase the capacity further by deploying another overlay network using $N = 3$ on top of the previous two layers (overlay with $N = 7$, and underlay with $N = 12$). Estimate now the new number of channels per cell and compute the capacity increase relative to the initial deployment?

Assume total number of channels equal to 124 for GSM network.