Homework # 4: Dynamic Channel Allocation

Rules: 1. Due by Tuesday, March 10, 2013
2. Solve all the problems below for 100 points - **independent work only.**
3. Show full solution to the problems - do not skip steps.

Problem number 1:
Consider a Reuse Partitioning system with two-tiers: tier-1 based on reuse of 3 and tier-0 based on reuse of 1. Label the radius of the cell as R_1 and the radius of the inner tier-0 cell as R_0. The total number of channels in the system is C_{total}. Calculate:

- The value of the ratio $R_0 \big/ R_1$.

- The total number of channels assigned to tier-0 and tier-1 areas as a fraction of C_{total}
- The total number of channels assigned to a cell as a fraction of C_{total}.
- The improvement over a regular (i.e., non-Reused Partitioning) network with *N=3.*

Problem number 2:
The reuse partitioning increases the number of channels available in each cell, but the *trunking efficiency* is reduced. Assume that $C_{total} = 395$, that each user produces 0.03 [Erlangs], and that the required QOS is 1% blocking probability. Compare the number of users in problem 1 with and without Reuse Partitioning.

Problem number 3:
A two-story building has 10 rooms on each floor. A wireless (radio) system is to be installed in the building, with each room being a cell in the system. Refer to the figure below for the schematics of the system. For purpose of identification, each room is labeled by three coordinates *(x,y,z).* For example, the room *A* in the figure is identified as (3,2,1).
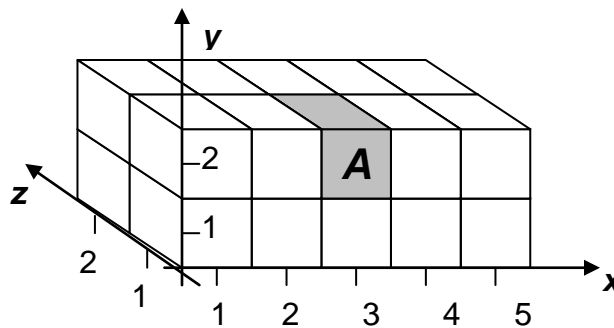
Assume that ~~Fixed Channel Allocation is used in the system and assume that~~ a channel cannot be re-allocated in any adjacent cells. (Two cells are adjacent if they share a boundary or <u>a corner</u>).

a. What is the maximum clique size of the corresponding graph?

b. If the following are the numbers of users in the cells (user demand vector):

Cell	# of users		Cell	# of users		Cell	# of users		Cell	# of users
(1,1,1)	5		(1,1,2)	2		(1,2,1)	1		(1,2,2)	2
(2,1,1)	3		(2,1,2)	3		(2,2,1)	3		(2,2,2)	3
(3,1,1)	1		(3,1,2)	2		(3,2,1)	2		(3,22)	5
(4,1,1)	0		(4,1,2)	2		(4,2,1)	1		(4,2,2)	2
(5,1,1)	5		(5,1,2)	1		(5,2,1)	5		(5,2,2)	2

What is the minimum number of system channels required to assign channel to all the users in the system?

c. If there are total of 20 channels in the system, what is the minimum number of users, if any, that will have to be blocked?

d. Assume that a hybrid channel assignment is used, in which there are 2 channels assigned to each cell using the *Fixed Channel Allocation* scheme and the rest of the channels in the system are assigned using the *Maximally Packed Dynamic Channel Allocation* scheme. What is now the total minimum number of channels required to satisfy the user demand in part (b) above?