**CS 6097 Wireless and Mobile Networking**

**Homework No. 5 dated Wednesday October 1, 2014**

**P 7.2** A TDMA system uses 270.833 kbps data rate to support 8 users per frame.

* 1. What is the raw data rate provided for each user?
  2. If guard time and synchronization occupy 10.1 kbps, determine the traffic efficiency?
  3. If (7, 4) code is used for error handling, what is the overall efficiency?

**[Solution]**

1. Since 8 users are supported per frame the raw data rate is  kbps
2. If 10.1 kbps is for guard and synchronization information the traffic efficiency is given by 
3. If (7, 4) code is used only 4 out of 7 bits contain the data. Thus the efficiency is 

**P 7.20** Use 16QAM to transmit a binary sequence, if the baud rate is 1200 Hz, how many bits can be transmitted in one second?

**[Solution]**

16QAM transmits 4 bits for each symbol. If the baud rate is 1200 Hz, the bit rate will be 16x1200=19200 or  symbols per second.

**P 8.8** In a cellular system, with 7-cell clusters, has the following average number pf calls at a given time:

|  |  |
| --- | --- |
| Cell number | Average number of calls/unit time |
| 1 | 900 |
| 2 | 2000 |
| 3 | 2500 |
| 4 | 1100 |
| 5 | 1200 |
| 6 | 1800 |
| 7 | 1000 |

If the system is assigned 49 traffic channels, how would you distribute the channel if

1. Static allocation is used based on traffic load.
2. A FCA Simple borrowing scheme is used (no traffic load considered).
3. A dynamic channel allocation scheme is used.

**[Solution]**

1. Distribute the channels according the traffic load of each cell.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Cell number | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| Channel number | 4 | 9 | 12 | 5 | 6 | 8 | 5 |

1. Allocate seven channels to each cell and borrow channels from adjacent cells with low traffic.
2. Channels are allocated dynamically as new call arrival in the system and is achieved by keep all free channels in a central pool.

**Additional information for question:**

**Part (a) Based on traffic load**

**Part (b) FCA with simple borrowing (no traffic load considered)**

**P 8.18** In a cellular system with 4 channels, one channel is reserved for handoff calls.

1. What is the value of *BO* and *BH* , given *λ*O = *λ*H = 0.001 and *μ* = 0.0003?
2. What are the values of probabilities *P*(0), *P*(1), *P*(2), *P*(3) and *P*(4).
3. What is the average number of occupied channels in this Problem?

**[Solution]**

*μ* = 0.0003, *S* = 4, *Sc* = 3, *λ*O = 0.001, *λ*H = 0.001

Using Equations (8.11), (8.12), and (8.13), we can compute

*P*(0) = 0.01, *P*(1) = 0.06, *P*(2) = 0.18, *P*(3) = 0.41, *P*(4) = 0.34

*B*O = *P*(3) + *P*(4) = 0.75

*B*H = P(4) = 0.34

The average number of occupied channels

