TD Cellular Wireless Networks

Mobile Netwotks

Exercise-1

a. Assume a system of 32 cells with a cell radius of 1.6 Km, a total of 32 cells, a total frequency bandwidth that supports 336 traffic channels, and a reuse factor of N=7. If there are 32 total cells, what geographic area is covered, how many channels are there per cell, and what is the total number of concurrent calls that can be handled?
b. Repeat for a cell radius of 0.8 Km and 128 cells

Exercise-2

Consider four different cellular systems that share the following characteristics. The frequency bands are 825 to 845 MHz for mobile unit transmission and 870 to 890 MHz for base station transmission. A duplex circuit consists of one 30 kHz channel in each direction. The system are distinguished by the reuse factor, which is 4, 7, 12, and 19

a. Suppose that in each of the systems, the cluster of cells (4, 7, 12, 19) is duplicated 16 times. Find the number of simultaneous communications that can be supported by each system
b. Find the number of simultaneous communications that can be supported by a single cell in each system
c. What is the area covered, in cells, by each system ?
d. Suppose the cell size is the same in all four systems and a fixed area of 100 cells is covered by each system. Find the number of simultaneous communications that can be supported by each system

Exercise-3

A telephony connection has a duration of 23 minutes. This is the only connection made by this caller during the course of an hour. How much is the amount of traffic, in Erlang, of this connection?

Exercise-4

- Using table 10.3, approximate the answers to the following. Also, in each case, give a description in words of the general being solved. Hint: Straight-line interpolation is adequate.
  a. Given N=20, A=10.5, find P.
  b. Given N=20, P=0.015, find A.

c. Given P=0.005, A=6, find N.
d. Given P=0.005, A=14.21, N?

	Capacity (erlangs) for grade of service of:				
Number of servers (*N*)	*P* = 0.02 (1/50)	*P* = 0.01 (1/100)	*P* = 0.005 (1/200)	*P* = 0.002 (1/500)	*P* = 0.001 (1/1000)
1	0.02	0.01	0.005	0.002	0.001
4	1.09	0.87	0.7	0.53	0.43
5	1.66	1.36	1.13	0.9	0.76
10	5.08	4.46	3.96	3.43	3.09
20	13.19	12.03	11.10	10.07	9.41
24	16.64	15.27	14.21	13.01	12.24
40	31.0	29.0	27.3	25.7	24.5
70	59.13	56.1	53.7	51.0	49.2
100	87.97	84.1	80.9	77.4	75.2

Exercise-5

An analog cellular system has a total of 33MHz of BW and uses two 25KHz simplex channels to provide a full duplex voice and CCH.

a. What is the number of channels available per cell for a frequency reuse factor 4, 7, and 12
b. Assume that 1 MHz is dedicated to CCH. Determine a reasonable distribution of control channels "CCH" and voice channels "TCH" in each cell for three frequency reuse factors of part 1.

Exercise-6

A cellular system uses FDMA with a spectrum allocation of 12.5 MHz in each direction, a guard band at the edge of the allocated spectrum of 10 kHz, and a channel bandwidth of 30 kHz. What is the number of available channels?