ITCS-424
Sem 2- 2019
Homework 3
6/3/20
Time Limit: Minutes

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This homework contains 6 pages (including this cover page) and 4 problems. Check to see if any pages are missing. Enter all requested information on the top of this page, and put your initials on the top of every page, in case the pages become separated.

You may *not* use your books, notes, but scientific calculator on this exam.

You are required to show your work on each problem on this exam. The following rules apply:

- **If you use a "fundamental theorem" you must indicate this** and explain why the theorem may be applied.
- **Organize your work**, in a reasonably neat and coherent way, in the space provided. Work scattered all over the page without a clear ordering will receive very little credit.
- **Mysterious or unsupported answers will not receive full credit**. A correct answer, unsupported by calculations, explanation, or algebraic work will receive no credit; an incorrect answer supported by substantially correct calculations and explanations might still receive partial credit.
- If you need more space, use the back of the pages; clearly indicate when you have done this.

Problem	Points	Score
1	5	
2	4	
3	3	
4	5	
Total:	17	

Do not write in the table to the right.

1. Cellular Concept

(a) (1 point) Why not a large radio tower and large serice area as in 1G mobilenetwork?

Solution: linited bandwidth

(b) (1 point) What are "advantages and disavantages" of cellular concept?

Solution: Advantage : increase system capacity
Disadvantage: higher cost

(c) (1 point) What is co-channel?

Solution: Cells with some frequency

(d) (1 point) Definete D is distance between the centers of two "co-channel" neighbour cells :

$$D^2 = 3NR^2$$

If we need 50 Km for distance between "co-channel" cells and the maximum distance between tower and mobile station 10 km then how many cells in a cluster?

Solution: $50^2 : 3N10^2$ | $25 : 3N$

$\frac{50^2}{100} : 3N$ | $N = 8.33$ cells $\approx$ 8 cells

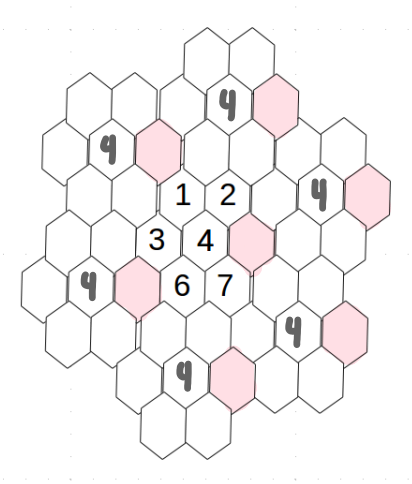
(e) (1 point) Supposed in the previous cellular network, given
N is the number of cells in each cluster.
J is the number of channel in each cell = 832 channel.
M is the number of clusters in the system = 10.

What is the total channel in the cellular system?

Solution: $k : J \times N : 832 : 8 = 6656$

$C : 10 \times 6656 : 66560$

2. Fundamentals of Cellular Networks, given cell structure for following questions.



(a) (1 point) What are value of N, i and j?

Solution: $N = i^2 + ij + j^2 = 4 + 2 + 1 \quad \therefore N = 7, i = 2, j = 1$

(b) (1 point) Where are the place for reuse frequency as cell number 5 in the system? Marking on given figure where frequency 4 reused.

Solution: 3

(c) (1 point) How many co-channels or interference to cell site number 5?

Solution: 6 co-channels

(d) (1 point) How to reduce interference signals from previous question to only 2 cells? Show solution with antenna and their interference with cell cluster on given figure above. Explain your solution below.

Solution:

Sectoring by divide into 3 sections

3. Celluar Network -Revolution

   (a) (1 point) List of name and main characteristic of cellular networks for 1G, 2G, 3G and 4G.

   Solution:
   1 G - Analog FDMA
   2 G - Digital + security TDMA has roaming (EDGE)
   3 G - MA CUM (DMA2000)
   4 G - CDMA LTE

   (b) (1 point) GSM service provider got uplink bandwidth 1700-1775 MHz and downlink 1800-1875 from NBTC, If they use FDMA, allocates 200kHz for each user. How many users in this network enabled only FDMA?

   Solution: uplink : 1775 - 1700 : 75 MHz
   down link : 1800 - 1875 : 75 MHz
   * of users : $\frac{75 \times 10^6}{200 \times 10^3}$: 375 users

   (c) (1 point) Consider information from (b), they enable TDMA, each of these channels is then further divided into 8 time slots. Combining both FDMA and TDMA together, how many users this provider can support in one cell?

   Solution:
   8 × 375 : 3000 users

4. GSM Cellular System, explain following entities and their functions.

   (a) (1 point) The Mobile Station (MS).

   Solution: receive and for transfer data via network

   (b) (1 point) The Base Station Subsystem (BSS).

   Solution: Connect MS × NSS, take of transmission

   (c) (1 point) The Network and Switching Subsystem (NSS).

   Solution: handle switching of GSM cells

   (d) (1 point) The Operation and Support Subsystem (OSS).

Solution: Includes operation and maintenance center

(e) (1 point) List four important data base in the mobile system and their content.

Solution:
1. Home location register - IMSI
2. Visitor location register - IMSI
3. Equipment - IMBI
4. Authentication Register