

New York University
Computer Science Department
Courant Institute of Mathematical Sciences

Course Title: Data Communication & Networks
Instructor: Jean-Claude Franchitti

Course Number: g22.2662-001
Session: 5

Assignment #5

I. Due

Thursday, October 28 2021 at the beginning of class.

II. Objectives

1. Learn wireless and mobile networks concepts.

III. References

1. Slides and handouts posted on the course Web site
2. Textbook chapter 7

IV. Software Required

1. Microsoft Word.
2. Win Zip as necessary.

V. Assignment

Problem 1: 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?

Problem 2: Walsh codes are the most common orthogonal codes used in CDMA applications. A set of Walsh codes of length n consists of the n rows of an $n \times n$ Walsh matrix.

- a) Research and describe how a Walsh matrix is defined recursively.
- b) What is a known property of every row of a Walsh matrix?
- c) Show the Walsh matrices of dimensions 2, 4, and 8.
- d) Demonstrate that the codes in an 8×8 Walsh matrix are orthogonal to each other by showing that multiplying any code by any other code produces a result of zero.

Problem 3: Considering a two-sender and two-receiver configuration, give an example of at least two CDMA codes that contain 1 and -1 values that do not allow the two receivers to extract the original transmitted bits from the two CDMA senders.

Problem 4: Research and describe the format of the 802.15.1 Bluetooth frame. Is there anything in the frame format that inherently limits the number of active nodes in an 802.15.1 network to eight active nodes? Please explain your answer.

Problem 5: Consider two mobile nodes in a foreign network having a foreign agent. Is it possible for the two mobile nodes to use the same care-of-address in mobile IP? Please explain your answer.

Homework Submission Guidelines:

1. Save the file as a Word document.
2. Name the file “**firstname_lastname_hw_5.doc**” (e.g., “john_doe_hw_5.doc”).
3. Submit your assignment electronically via NYU Brightspace by the due date.

Use the following naming convention in the subject line of the eMail:
“**DCN - firstname lastname - homework 5**”
(e.g.: “DCN – John Doe - homework 5”).

In the case source code is submitted, include your name as a comment at the top of each file.

(Note: all files submitted should include your name).

VI. Deliverables

1. Electronic:

Your assignment file must be submitted via NYU Brightspace. The file must be created and sent by the beginning of class. After the class period, the homework is late. The email clock is the official clock.

2. Cover page and other formatting requirements:

The cover page supplied on the next page must be the first page of your assignment file.

Fill in the blank area for each field.

NOTE:

The sequence of the electronic submission is:

- 1. Cover sheet**
- 2. Assignment Answer Sheet(s)**

Assignment Layout (25%)

- Assignment is neatly assembled on 8 1/2 by 11 layout.
- Cover page with your name (last name first followed by a comma then first name), username and section number with a signed statement of independent effort is included.
- Answers to Questions 1 to 6 are correct.
- File name is correct.

Answers to Individual Questions:

(100 points total, all questions weighted equally)

- Assumptions provided when required.

VII. Sample Cover Sheet:

Name _____ Date: _____
(last name, first name)

Section: _____

Assignment 5

Total in points (100 points total): _____

Professor's Comments: