Sirindhorn International Institute of Technology

Thammasat University at Rangsit

School of Information, Computer and Communication Technology

ECS 455: Problem Set 5

Semester/Year: **2/2016**

Course Title: Mobile Communications
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Course Web Site: http://www2.siit.tu.ac.th/prapun/ecs455/

Due date: April 28, 2017 (Friday), 4:30 PM

Instructions

1. (1 pt) Write your first name and the last three digits of your student ID on the upper-right corner of every submitted sheet.
2. (1 pt) For each part, write your explanation/derivation and answer in the space provided.
3. (8 pt) It is important that you try to solve all non-optional problems.
4. Late submission will be heavily penalized.

Questions

1. Consider Global System for Mobile (GSM), which is a TDMA/FDD system that uses 25 MHz for the forward link, which is broken into radio channels of 200 kHz. If 8 speech channels are supported on a single radio channel, and if no guard band is assumed, find the number of simultaneous users that can be accommodated in GSM.

2. Consider a sequence $x[n]$ = (1 -1 2 -2 3). Plot its autocorrelation function $R_X[\tau]$ from $\tau = -4$ to 4.

3. Consider a periodic sequence $x[n]$. Each complete cycle of it is a sequence (1 -1 2 -2 3).
   a. Plot its autocorrelation function $R_x[\tau]$ from $\tau = -5$ to 5.

   b. Is $R_x[\tau]$ periodic? If so, find the period of $R_x[\tau]$.

4. Draw the complete state diagrams for linear feedback shift registers (LFSRs) using the following polynomials. Does either LFSR generate an m-sequence?

    a. $1+x^2+x^5$

    b. $1+x+x^2+x^5$

    c. $1+x+x^2+x^4+x^5$

5. Use any resource, find <u>all</u> primitive polynomials of degree 6 over GF(2). Indicate your reference.