Problem Set #10:

Homework will not be collected.

Reading: Chapters 14 and 15

Please use MATLAB to help you solve these problems, check answers, etc.

Problem 10.1  Multiple Access

A TDMA system uses a 42 kbps data rate to support 3 users per frame. Each user occupies 2 of the 6 time slots per frame.

(a) What is the raw data rate provided for each user?

(b) TDMA systems dedicate some of bits for synchronization and other control purposes. This reduces the amount of time dedicated for actual data bits. For instance, if all the bits are dedicated during a transmission of frame, the system would 100% efficient. If the frame efficiency is 80% and the frame duration is 6.667 ms, determine the number of information bits sent to each user per frame. Assume no overhead at the slot level.

(c) If speech coding that reduces the data rate by half is used, then 6 users per frame can be accommodated. Determine the number of information bits provided for each user per frame.

(d) What is the information rate per user in this half-rate compressed TDMA system?

Problem 10.2  CDMA

In a CDMA system, $10^{-3}$ probability of bit error is required for each user. Assume that all the users’ signals are chip and phase synchronized at the receiver. The received $E_b/N_o$ for each user without interference is 10 dB and the users use BPSK transmission. If 100 users, each with a baseband data rate of 13 kbps, are to be accommodated, find the minimum required spread spectrum channel bandwidth for the following cases:

- Orthogonal spreading codes
- PN spreading codes

Problem 10.3

Problem 15.3 in Wireless Communications

Problem 10.4

Problem 15.11 (a) and (b) in Wireless Communications