New York University
Computer Science Department
Courant Institute of Mathematical Sciences

Course Title: Data Communication & Networks
Course Number: g22.2662-001
Instructor: Jean-Claude Franchitti
Session: 3

Assignment #3

I. Due Dates:

- Answers to Problems 1-4 due on Thursday October 15, 2015 at the beginning of class.
- Program solutions (i.e., answer to Question V.5) due on Thursday November 5, 2015 at the beginning of class.

II. Objectives

1. Experiment with Data Encoding and Transmission.
2. Program using sockets.

III. References

1. Slides and handouts posted on the course Web site

IV. Software Required

1. Microsoft Word
2. Win Zip as necessary

V. Assignment

1. Problem 1:

   Develop algorithms for generating each of the codes shown in slide 29 of the Session 3 slide deck on Data Encoding and Transmission from NRZ-L.

2. Problem 2:

   Enhanced NRZ (E-NRZ) is used for high-density recording on magnetic tape. It separates the NRZ-L data stream into 7-bit words, inverts bits 2, 3, 6, and 7, and adds a parity bit to each word. In this case, the parity bit is chosen to make the total number of 1s in the 8-bit word an odd count. Explain the advantages and disadvantages of E-NRZ over NRZ-L.

3. Problem 3:

   For the bit stream 01010110, sketch the corresponding waveforms for NRZ-L, NRZI, Bipolar-AMI, Pseudoternary, Manchester, and Differential Manchester. Assume that the signal level for the preceding bit for NRZI was high; the most recent preceding 1 bit (AMI) has a negative voltage; and the most recent preceding 0 bit (pseudo ternary) has a negative voltage.

4. Problem 4:

   Consider a stream of binary data that consists of a long sequence of 1s followed by a zero followed by a long string of 1s and the same assumptions as in Problem 3 above. Draw the waveform for this sequence using:

   (a) NRZ-L
   (b) Bipolar-AMI
   (c) Pseudoternary

5. Programming Assignment (due on 11/05/15):

   In an OO programming language of your choice, implement at least two of the following applications:

   1. Multi-Threaded Web Server
   2. UDP Pinger
   3. Mail User Agent
   4. Multi-Threaded Web Proxy Server

   For each one of two of the applications you are implementing, identify and implement two enhancements or special features of your choice.

   See the Socket Programming Assignments at the end of Chapter 2 of the textbook for more information and feel free to leverage the code provided for all or parts of the applications.

VI. Deliverables

1. Electronic:

   Your assignment solution file and program report/code must be emailed to the course grader. The assignment solution and program report/code must be created and sent by the beginning of class as per the corresponding due date. After the class period, the assignment 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 solution and program report submission.

   Fill in the blank area for each field.

   NOTE:

   The sequence of the hardcopy submission for the assignment solution and program report is:

   1. **Assignment solution / program report cover sheet**
   2. **Actual assignment solution / program report sheet(s)**

VII. Sample Cover Sheet:

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

Assignment 3

Assignment Solution / Program Report Layout (25%)

☐ Assignment solution / program report are neatly assembled on 8 1/2 by 11 paper.
☐ Cover pages 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.
☐ File names are correct.

Proper Program Documentation Provided:

☐ Assignment solution / program report include the details mentioned in section V above.
☐ Assumptions are provided when required.
☐ Program code is properly commented.

Total in points (100 points total): _____

Professor's Comments: