# Electrical, Computer, and Systems Engineering
# ECSE-4670: CCN
# Fall 1999

## Problem Set 2- Due Monday, October 4th 1999

| **Your Name** | |
|---|---|

**Notes:**

1. Be brief and precise, but complete in your answers
2. A part of the homework credit is given to reading. Reading assignments will be quizzed in both informal and formal quizzes
3. Please write your answers on separate sheets and staple it along with the questions to facilitate easy grading.

-------------------------------Do not write below this line----------------------------------------

| 1 | 2 | 3 | 4 | 5 | Total |
|---|---|---|---|---|---|
| | | | | | |
| 20 | 5 | 5 | 10 | 10 | 50 |

TA Signature :___________________________________

1. ***Reading assignment:***
   - Read the textbook (Tanenbaum) Chap 2 and 3. Summarize key concepts and issues NOT covered in class. For each concept/issue a one-line *descriptive* summary is what is required, nothing more or less.
2. ***Concepts: (Modulation/Coding)*** What is/are the functional difference(s) between modulation techniques like ASK, PSK, FSK and signaling/coding schemes like NRZ/Manchester etc ? Given a data rate of 10 Mbps (like Ethernet) and the use of Manchester encoding, what is the resultant baud rate?
3. ***Problem: (Nyquist/Shannon limits)*** A cable operator wants to convert a regular 6 MHz TV channel to carry data using 4-level signals. What is the maximum data rate he can expect from the channel ? Even if he had the luxury of choosing an arbitrary numbers of levels in signaling, given that the S/N ratio is 20 dB, what is the maximum data rate possible ?
4. ***Problem (Error Detection)***: What is the Hamming distance of the codespace containing the following three code words: 010101, 001111 and 001010 ? What is the maximum Hamming distance possible using 6-bit codewords (assuming at least two codewords) ? Given the CRC polynomial $P(x)= x^5 + x^4 + x^2 + 1$ and the message payload, M = 1110001101, find the bit pattern T calculated from the CRC procedure which will be transmitted on the wire.
5. ***Problem (Flow Control/Error Recovery)***: Complete the missing steps in the derivation of the performance of the Go-back-N ARQ procedures based upon slides 41-44 in the handout. Your goal is to derive an expression for the channel utilization U in terms of the window size, N, loss probability P and the ratio of propagation-to-transmission times, $\alpha$.