Cpr E 489 (Spring 2020) Midterm #1 Review

Topic 1: Introduction and Layered Networking Architecture

- Three communication networks [Chapters 1.0, 1.1]
  - Key differences between three transfer modes
- 7-layer OSI reference model (Fig. 2.4) [Chapter 2.2.1]
  - Key functions of each layer; example protocol at each layer
  - Encapsulation (Fig. 2.7)
- 4-layer TCP/IP model [Chapter 2.3]
  - Key functions of each layer; example protocol at each layer
  - Figs. 2.12, 2.13, 2.14

Topic 2: Physical Layer

- Digital transmission fundamentals
- Transmission channel [Chapters 3.2, 3.5]
  - Channel bandwidth, Nyquist rate
  - Bit rate, Baud rate
  - Shannon channel capacity
- Line coding [Chapter 3.6, lecture notes]
  - Unipolar NRZ, Polar NRZ, Bipolar (B8ZS, B6ZS), NRZ Inverted
  - Manchester, Differential Manchester, 2B1Q
  - Bandwidth requirement (Fig. 3.36)

Topic 3: Error Detection and Recovery

- Error detection [Chapter 3.9 with corrections on lecture notes]
  - Pattern, redundancy, undetectable errors
  - Fraction of undetectable errors
  - Parity check code, 2-out-of-5 code
  - CRC codes
    - Fundamentals
    - Shift-register circuit (Fig. 3.69)
    - Error-detecting capability: error bursts
- ARQ protocols [Chapters 5.0, 5.2 with corrections on lecture notes]
  - Stop-and-Wait ARQ (1-bit sequence numbering suffices)
  - Go-Back-N ARQ (m-bit sequence numbering: $2^m \geq N+1$)
  - Selective Repeat ARQ (m-bit sequence numbering: $2^m \geq W_s + W_r$)
  - Why S&W $\rightarrow$ GBN $\rightarrow$ SR?