Midterm Review

I.   Introduction
   A. Definitions
      1. network vs distributed system
      2. classify networks
         a. transmission technology - broadcast, multicast, point-to-point
         b. size - LAN, MAN, WAN
         c. topology - star, ring, tree
      3. performance measures
         a. throughput
         b. utilization
         c. response time
         d. end-to-end delay
            i.   processing delay
            ii. queueing delay
            iii. transmission delay
            iv. propagation delay
         e. latency
         f. goodput
         g. fairness
   B. Elementary TCP Sockets
      1. Client/server model
      2. structure of sockaddr_in
      3. socket functions
         a. *socket*
         b. *connect*
         c. *bind*
         d. *listen*
         e. *accept*
         f. *close*
   C.   Seven Layer ISO OSI Reference Model
   D. Introduction to TCP/IP Protocol Stack
      1. IP addresses
      2. HTTP/DNS

II. Miscellaneous topics before physical layer
   A. Multiplexing   *{Note – multiplexing was covered just before*
      1. TDM   *PCM in the Physical Layer section}*
      2. FDM
      3. statistical multiplexing {concentrator}
   B. Switching
      1. circuit switching
      2. message switching
      3. packet switching

   C. Store-and-Forward Networks
      1. virtual circuit networks
      2. datagram networks
      3. connectionless versus connection-oriented networks

III. Physical Layer
   A. Definitions
      1. baud   {modulation rate}
      2. data rate   {capacity}
      3. bandwidth
      4. voice-grade line
   B. Nyquist Theorem
      1. signal constellations
   C. Shannon's Result
      1. signal-to-noise ratio
      2. decibel definition
   D. Analog vs Digital
      1. data
      2. signals
      3. transmissions
      4. attenuation
      5. amplifiers vs repeaters
      6. modem
      7. codec
      8. advantages vs disadvantages
   E. Data Encoding Techniques
      1. digital data, analog signals
         a. Amplititude modulation
         b. Frequency modualtion
         c. Phase modulation
      2. digital data, digital signals
         a. NRZL
         b. NRZI
            i. differential codes
         c. Bi-phase codes
            i.   Manchester
            ii. differential Manchester
      3. analog data, digital signals
         a. PCM
         b. T1 carrier
         c. delta modulation
   F. Transmission Media
      1. twisted pair
         a. UTP Cat 3,4, 5,5e,6
         b. ADSL
         c. Hub topology

        2. Coaxial cable
           a. baseband
              i. 10BASE2
              ii. 10BASE5
           b. broadband {CATV}
        3. Optical Fiber
           a. three types of fiber
IV. Data Link Layer
  A. Transmission Errors
      1. error detection and error correction
      2. Hamming distance
      3. CRC
         a. polynomial code
         b. generating function $G(x)$
         c. CRC algorithm
  B. Synchronous vs asynchronous transmissions
      1. bit, character, block level
  C. Framing
      1. bit stuffing
      2. byte stuffing
  D. Tanenbaum's DL protocols
      1. Utopia
      2. Stop-and-Wait   {introduce ACKs}
      3. PAR   {noisy channel}
         a. old version
           1. ACK, timer, duplicate frames
         b. "new version" {ACKs, timers, premature timeouts}
      4. Sliding Window Protocols
         a. piggybacking ACKs
         b. 1-bit sliding window (protocol 4)
         c. Go Back N (protocol 5)
         d. Selective Repeat (protocol 6)
         e. window size versus max sequence number
         f. NAKs, ACKtimer
---------------------**only up to here for Mid Term!!** ---------------------------
V.   Medium Access Sublayer (MAC)
 A.   "The Channel Allocation Problem"
      1.   assumptions
 B.   LAN Performance Notation
      1.   relative propagation time - **a**
      2.   S, I, and G {throughput, input load, offered load}
 C.   ALOHA
 D.   Slotted ALOHA
 E.   CSMA
  1.   non-persistent
  2.   1-persistent

   3.   p-persistent
  F.   CSMA/CD
  G.   Ethernet