Midterm Review

I. Introduction
  A. Definitions
    1. network vs distributed system, internet
    2. paradigms
      a. Client/server model
      b. Peer-to-Peer (P2P)
    3. classify networks
      a. transmission technology - broadcast, multicast, point-to-point
      b. size – PAN, LAN, MAN, WAN, WSN
      c. topology - hierarchical, bus, ring, tree, star
    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. structure of sockaddr_in
    2. socket functions
      a. *socket*
      b. *connect*
      c. *bind*
      d. *listen*
      e. *accept*
      f. *close*
  C. Network Architecture and the OSI Reference Model
    1. IP addresses
    2. Layering and Protocols
II. Switching
  A. circuit switching
  B. message switching
  C. packet switching
  D. cell swithcing
  E. Store-and-Forward vs Cut-Through Networks
    1. virtual circuit networks
    2. datagram networks
    3. connectionless versus connection-oriented networks

III. Introduction to Application Layer
- A. Application Requirements (QoS)
- B. HTTP
  1. Persistent vs Non-persistent HTTP
  2. Request and Response message format
  3. Cookies
  4. Web Caching (Proxy Server)
- C. DNS
  1. Name service
  2. DNS Server Classes
     a. Root
     b. Top-Level Domain (TLD)
     c. Authoritative
     d. Local name server
  3. Iterative vs recursive name resolution
  4. Caching
  5. Query and reply resource records

IV. 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 (ASK)
     b. Frequency modulation
        i. BFSK
        ii. MFSK
     c. Phase modulation

i. BSPK
ii. QPSK
d. QAM
e. Telephone Modems
2. digital data, digital signals
a. NRZL
b. NRZI
i. differential codes
c. Bi-phase codes
i. Manchester
ii. differential Manchester
d. Bi-polar codes
3. analog data, digital signals
a. Multiplexing **{detour}**
1. TDM
2. FDM
3. statistical multiplexing {concentrator}
4. WDM
b. PCM
c. T1 carrier
d. delta modulation

F. Transmission Media
1. twisted pair
a. UTP Cat 5e,6,7
b. Dial Up
c. ADSL and xDSL
d. Hub topology (10BASET)
2. Coaxial cable
a. baseband
i. 10BASE2
ii. 10BASE5
b. broadband {CATV}
c. Hybrid Fiber-Coaxial (HFC)
3. Optical Fiber
a. three wavelengths
b. three types fiber
c. FTTH

V. 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 (HDLC and PPP)
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

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
   4. collisions
F. CSMA/CD
G. Token Ring
H. Ethernet
   1. binary exponential backoff
   2. Ethernet evolution (10Base5, 10Base2, 1Base5, 10BaseT)
I. Switched Ethernet
   1. backward (self) learning
I. Bridges
   1. backward learning
   2. collision domains
   3. loops
      a. transparent bridges (spanning tree)
      b. source routing bridges

----------only up to here for Mid Term!! ----------

VI. High Speed LANs
- A. FDDI
- B. Fast Ethernet
- C. Gigabit Ethernet (and 10 and 100 Gig)

VII. Wireless LANs
- A. Classification
  1. Infrastructure
  2. Ad Hoc
  3. MANET
- B. 802.11 Protocols
  1. infrared
  2. FHSS
  3. DHSS
  4. 802.11a
  5. 802.11b
  6. 802.11g
- C. MAC Sublayer
  1. Hidden Terminal Problem
  2. Exposed Station Problem
  3. DCF
     a. CSMA/CA
        i. MACA
        ii. RTS/CTS
        ii. MACAW with Virtual channel sensing
        iv. 1-persistent physical carrier sensing
  4. Frame fragmentation
  5. PCF
     a. beacon frame
  6. Implementation Details