Final Exam Guide

This material, if not specified, guides you at the level covered at lectures.

Final Exam Specification

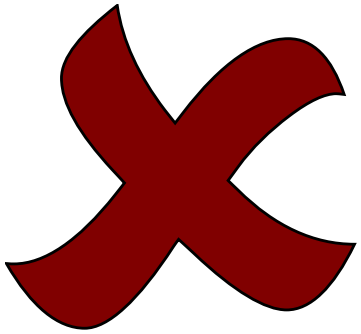
- 2 hour long, the exam date and time
  - See email
  - Online, same setting as mid-term quiz
- Closed book
- 2 pages of notes allowed
  - Hand written only
- Question types:
  - Like mid-term

Chapter 1–Intro to Networks
Important to Know

- What is Internet, protocol?
- Network Edge
- Network Core
  - Packet switching vs. circuit switching
  - Network structure
- Network delay, loss and throughput
- OSI model, TCP/IP protocol stack
  - Layers, Protocols
  - Encapsulation
- Network security: DoS, packet sniffering,IP spoofing

Chapter 1–Intro to Networks
Do not worry about

- Specific Frequencies of Media
- Specific upstream and downstream data rates of edge networks
- Loss calculations

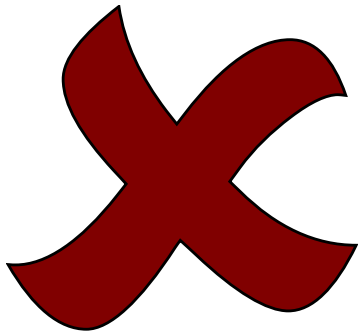


Chapter 2– Application Layer
Important to Know

- Principles of network applications:
  - Architecture: client/server vs. P2P
  - Process communication, sockets, transport services (TCP/UDP)
- Web and HTTP:
  - persistent/non-persistent, cookie, web cache
- FTP
- SMTP, POP3, IMAP
- DNS
- P2P
- Socket programming

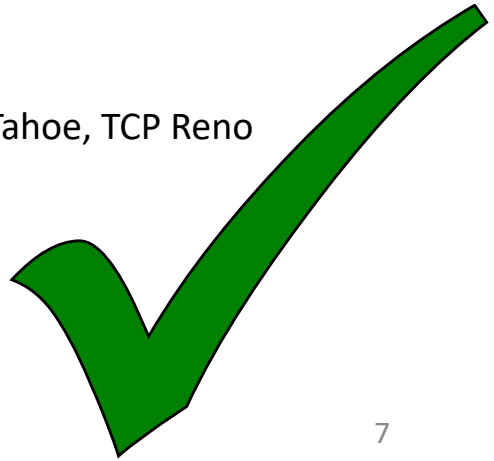
Chapter 2-Application Layer
Do not worry about

- Detailed Packet formats of various application protocols, etc... BUT YOU SHOULD KNOW THE FIELDS



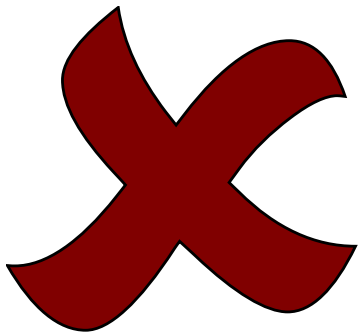
Chapter 3–Transport Layer
Important to Know

- Transport Layer Services, Transport Layer vs. Network Layer
- Multiplexing and De-multiplexing
- UDP, UDP checksum
- Reliable Data Transfer:
  - Stop and Wait, Piplined protocols
    - Go-Back-N (GBN), Selective Repeat(SR) protocols, examples
    - Note the differences between these protocols including buffer requirements at sender and receiver.
- TCP
  - Sequence Numbers
  - Acknowledge Numbers
  - TCP fast retransmission
  - Flow control
  - Congestion Control, rwnd
  - Connection management: 3-way handshake
  - TCP Congestion Control: cwnd, Slow Start, congestion avoidance, TCP Tahoe, TCP Reno
- TCP fairness:
  - UDP vs. TCP
  - When to use TCP or UDP, why



Chapter 3–Transport Layer
Do not worry about

- Detailed packet format for transport protocols but **should know the fields and functions**
- Timer calculation detailed formulas involving standard deviation, but must understand components of the basic dynamic timer formula

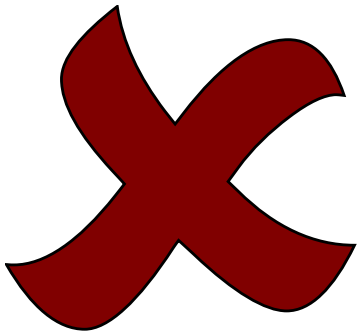


Chapter 4–Network Layer
Important to Know

- Forwarding and Routing
- Network Service Models: Best Effort and Guaranteed Delivery.
- Datagrams vs. Virtual Circuits
- Router Internals: Input, Switch Fabric, Output
- Internet Protocol (IPv4)
  - Header Information, the purpose of the various fields
  - IP Fragmentation, Reassembly and calculations (example)
  - IP Addressing, forwarding, hierarchy
    - Subnets, CIDR
    - DHCP, NAT, ICMP
    - IPv6, tunneling
- Routing Algorithms
  - Link-State (Dijkstra), example
  - Hierarchical Routing: Advantages, Autonomous Systems, etc
  - Corresponding routing protocols: OSPF, BGP

Chapter 4-Network Layer
Do not worry about

- Detailed packet format for IP protocol but **should know the fields and functions**
- Any details not covered during lecture.



Chapter 5–Link Layer
Important to Know

- Purpose, context and services of Link Layer
  - NIC
- Error Detection
  - Parity checking
  - CRC example
- Multiple access problem and protocols
  - Channel partitioning, random access, taking turns
  - TDMA, FDMA, slotted ALOHA, pure ALOHA, CSMA/CD, polling, token passing
- LAN, MAC address, ARP, addressing
- Switch
  - self learning
  - Switch vs. Routers
  - Data center networks
- Port-based VLAN
- A day in the life of a web request

Chapter 6–Network Security
Important to Know

- Fundamental concepts of network security
  - Confidentiality, authentication, message integrity, availability

- Principles of cryptography
  - Encryption vs. decryption
  - Symmetric vs. asymmetric encryption
  - Public key v. private key
  - How to use public key cryptography for confidentiality
  - How to use public key cryptography for digital signature
  - How to fix the problems in AP 1.0-AP 5.0?

Good Luck!

Happy Holiday!