CSE 3461 Midterm Study Guide
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The midterm will cover material on the introduction, application layer, and transport layer from the course textbook (Kurose and Ross, Computer Networking: A Top-Down Approach, 7th ed., Addison Wesley, 2017). The textbook will be denoted [CNTDA]. I strongly suggest you buy a physical copy of [CNTDA] if you haven’t already; it’s easier to read on paper. The midterm material is mainly from Chapters 1–3 in [CNTDA], the corresponding lecture slides, and the applets on the companion website. Important material is in bold. Below, § means Section; §§ means Sections.

Chap. 1: Introduction
– What is the Internet? (§1.1)
– Hosts, end systems
– Protocol
– Network edge (§1.2)
– Wired vs. wireless media
– Network core (§1.3)
– Packets and packet switching
– Store-and-forward transmission
– Circuit switching and packet switching (§1.3.2)
– End-to-end principle (connections, systems)
– Circuit switching: FDMA, TDMA
– The Internet: a network of networks (internetwork)
– Delay, loss, throughput in packet-switched networks (§1.4)
– Types of delay: processing, queueing, transmission, propagation
– Average queueing delay vs. traffic intensity
– Throughput in computer networks
– Protocol layers (§1.5)
– Layering as an architectural principle, services provided by each layer, encapsulation/decapsulation
– Layers in OSI, TCP/IP models

Chap. 2: Application Layer
– Principles of network applications (§2.1)
– Client-server vs. P2P architectures
– Clients, servers, datacenters
– Communicating processes (§2.1.2)
– Sockets, IP addresses, port numbers
– Transport services: reliable vs. unreliable data transfer
– Network application requirements: data loss, throughput, timing
– The World Wide Web and HTTP (§2.2)
– Parallel, persistent, and non-persistent connections (§2.2.2)
– Request-response architecture (HTTP GET) (§2.2.3)
– HTTP cookies (§2.2.4)
– Web caching and performance (§2.2.5)
– Conditional GET (§2.2.6)
– FTP (§2.3)
– Email in the Internet (§2.4)
– SMTP (§2.4.1)
– POP3, IMAP, Web mail (§2.4.4)
– DNS (§2.5)
– DNS architecture, hierarchy of name servers
– Iterative vs. recursive queries
– DNS resource records and messages
– P2P applications (§2.6)
– P2P file distribution vs. client-server (§2.6.1)
– BitTorrent
– Distributed Hash Tables (DHTs) (§2.6.2)
– Circular DHTs and shortcuts

Chap. 3: Transport Layer
– Transport-layer services (§3.1)
– Logical end-to-end connection between processes
– Multiplexing and demultiplexing (§3.2)
– Source & destination IP addresses, port numbers
– UDP (§3.3)
– Internet applications’ transport protocols
– UDP checksum (§3.3.2)
– Principles of reliable data transfer (RDT) (§3.4)
– RDT over channels with errors, losses
– Acknowledgments (ACKs), sequence numbers, timers
– Stop-and-wait vs. pipelined protocols
– Alternating-bit protocol
– Channel utilization
– Go-Back-N (GBN) (§3.4.3)
– Selective Repeat (§3.4.4)
– TCP (§3.5)
– Three-way handshake (connection establishment)
– Four-way handshake (connection teardown)
– TCP segment structure
– RTT estimation and timeout
– TCP state machine (client, server aspects)
– Principles of congestion control (§3.6)
– TCP congestion control (§3.7)
– Slow start, congestion avoidance, fast recovery
– TCP congestion: an AIMD protocol
– TCP throughput (macroscopic view)
– Average throughput of a connection
– TCP fairness