Bring a calculator and one page of notes (printed or handwritten). You can use the calculator in your cell phone but you must abide by the UT-Austin Student Honor Code. More specifically, you must not use the phone for any other purpose, such as accessing information stored in the phone or on the Internet.

Review homework solutions

Note: Following lists of major topics for your reference only - It is possible to have exam questions on materials covered in my lectures that are not in the following lists

**Chapter 1 topics**

- Modulation and demodulation, FDM/TDM/WDM, Shannon Theorem, and Sampling Theorem
- Circuit switching, message switching, packet switching, virtual circuit packet switching; Internet structure
- Four components of delay in packet switching; bottleneck and throughput; traffic intensity and server utilization; packet loss
- Little's Law, mean value and second moment formulas of a random variable
- M/G/1 waiting time and delay formulas (and two special cases), justification of packet switching over circuit switching
- Internet layered architecture, protocol stack, encapsulation, de-encapsulation

**Chapter 2 topics**

- Client-server vs P2P architecture
- Addressing processes - IP address and port number
- Application needs vs transport protocol services
- HTTP, SMTP, DNS, P2P:
  - Stateful vs stateless protocol, complexity at the network’s edge
  - HTTP - including client-server delay in terms of round-trip times, persistent vs, nonpersistent, cookies and proxy cache,
  - SMTP - using ascii characters only, MIME, base 64 encoding
  - Various DNS servers and various DNS records
  - File distribution delay analysis to show why P2P is more scalable than client-server
- Sockets for TCP and UDP; welcome, connection, and datagram sockets
Chapter 3 topics

IP address and port numbers, multiplexing/demultiplexing

Services provided by TCP and UDP

Internet checksum, TCP timeout estimation algorithms

Protocol design for Lossy FIFO channel and Lossy, Reordering, and Duplicative (LRD) channel

Alternating-bit protocol, pipelined protocols

sliding window protocol (general principles and implementation in TCP), cumulative acks

ARQ, sliding window (including selective repeat, and go-back-N) performance analysis

TCP three-way handshake protocol, connection close protocol

TCP flow control, TCP congestion control (Reno versus Tahoe, slow start, threshold, duplicate acks, fast retransmission, fast recovery), TCP throughput, additive increase multiplicative decrease (AIMD)