Ph.D. Qualifier Information
Networks Study Guide

The qualifier exam covers CS365 material

Suggested Text:
Computer Networking, A Top-Down Approach, 6/E, Kurose, Ross

Scope:
Chapters 1-8 (not including Chapter 9 Network Management)

Introduction
Internet, network architecture, protocol layers and functions, performance metrics
A sample question: what is the function of the presentation layer in the OSI model?

Application layer
client-server model and peer-to-peer model, example applications
A sample question: what is the advantage of peer-to-peer model compared to the client-server model?

Transport layer
process-to-process communication; multiplexing and demultiplexing; UDP and TCP; reliable data transfer; flow control; congestion control
A sample question: How to launch an attack against the three-way handshaking protocol of TCP?

Network layer
data forwarding and routing; IP; ICMP; link state routing and distance vector routing algorithms; RIP and OSPF
A sample question: given a network (abstract graph), how to calculate the routing paths from a given node to all other nodes by using the link state routing algorithm?

Data link layer
error detection methods: parity check, checksum, CRC; multiple access protocols: ALOHA, slotted ALOHA, CSMA, CSMA/CD; Ethernet; hubs and switches; address resolution protocol
A sample question: derive the efficiency of ALOHA.

Wireless networks
IEEE 802.11 MAC; hidden terminal problem; exposed terminal problems; interconnection between a wireless LAN and a wired LAN
A sample question: why cannot we just use the Ethernet protocol in wireless networks?

Multimedia networking
classification, limit of the Internet, streaming stored audio/video, RTP
A sample question: what application layer mechanisms can be used to remove jitter?

Network security
various aspects of network security; symmetrical key cryptography and public key
cryptography; digital signature; authentication
A sample question: how to achieve data confidentiality and message integrity in
emails?

Submitted by Professors Cheng and Chellappan 2014