DNA 2010 - Exam Questions

Mx: Main (primary) questions.
Cx: Control (secondary) questions.

1 Computer Architecture

M1. Digital logic circuits

How are digital logic circuits made and how are they used to build boolean functions and higher level functions? *Keywords: transistor, dissipation, logic gates, truth tables.*

M2. Data and program representations

How are data and programs represented? *Keywords: binary numbers, opcode, operands.*

M3. Processor architecture

What is the general structure of processors and how do they work? *Keywords: execution units, fetch-and-execute cycle, pipeline.*

M4. Virtual memory

Explain the virtual memory system and its hardware support. *Keywords: MMU, execution modes, memory protection, paging, TLB.*

M5. Caches

Explain the role of caches, how (and why) they work, and their impacts for programmers. *Keywords: locality, write-through and write-back caches, associativity, LRU policy, memory mountain experiment.*

C1. Binary numbers

How are integers encoded?

C2. Architecture

What is the Von Neumann architecture and what is its bottleneck?

C3. Microcode

What are microcodes and macrocodes and why do we have both?

C4. Instruction sets

Compare the CISC and RISC instruction sets.

C5. Assembly languages

Which types of instructions are available? Give an example of common programming pattern (pseudo-assembly code).

C6. Memory

What is data alignment and why is it important?

C7. Size units

Why is it important to use powers of 2?

C8. Technology

Compare SRAM and DRAM technologies.

C9. Memory

Explain the term memory hierarchy.

2 Computer Networks

M1. The Internet

Explain the OSI model, how is it related to the Internet Protocol Stack (5 layers). Explain Circuit and Packet switching (pros and cons, how do they differ?).

M2. Application Layer

In the Internet Protocol Stack, What does the Application Layer do? Explain any two of the following protocols, HTTP, FTP, SMTP/POP3/IMAP, and DNS.

M3. Transport Layer

What is the main function of the transport layer protocols? How does TCP implement the reliable transmission in the Internet?

M4. Explain TCP, flow control, and congestion control

M5. The Network Layer

Explain VC/Datagram Networks, and any three of the following: IP, IP addressing, subnetmask, and NAT.

M6. Routing Algorithms

Explain Link-state (Dijkstra's), or Distance vector. Demonstrate Dijkstra's (or distance vector). Explain how the two algorithms relate to RIP and BGP.

M7. The Link Layer and LANs

What is ARP protocol? Which information can a ARP table contain possibly? Please describe in detail how the translation is done and how to send a datagram to a host over the Internet.

M8. MAC layer protocols

We can classify multiple access protocol into three categories: channel partitioning protocols, random access protocols and taking turns. Please explain their principle respectively.

C1.Application layer

What is a socket? How can it be used?

C2. TCP/UDP

Isnt TCP always preferable to UDP since TCP provides a reliable data transfer service and UDP does not?

C3. Routing

What is the difference between routing and forwarding?

C4. DHCP

What is DHCP? How can it be used?

C5. MAC layer

What are the pros and cons of parity and CRC checks?

C6. Wireless LANs

Why does 802.11 not check for collisions? Why does it handle retransmissions?