

COMPSCI 314 S1 C

Study Guide 2006

Format of the exam

- Short-answer questions:
answer all of them
on the exam paper (as for the terms test)
- Question style similar to assignments and terms test:
 - Some questions are in one part
 - Others have several parts (a), (b), ...

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Exam technique

- Mark values for questions are different for each question – the paper tells you how many marks each question (or section of question) is worth
- Total marks = 120,
two hours (120 minutes) for the paper
 - that's about 1 minute per mark; leave time to go back to the 'hard' questions

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Slides vs Textbook

- The lecture *slides* (on the course *lectures* web page) tell you what was covered
- The slides are meant to direct you to the important parts of the textbook – the *textbook* provides more detail for you
- Material from the slides and their related textbook material may be in the exam
- Material from assignments or terms tests may also be in the exam

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Arithmetic

- Closed-book exam – no calculators
- But we do expect you to do some simple arithmetic, as for the terms test
- Simplify expressions wherever you can!
e.g. $(2 \times 1.5 \times 10^8) / (3 \times 10^8) = 1$!!!

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Logarithms

if $a^x = b$, then $\log_a(b) = x$

e.g., base 10: $10^{0.3010} = 2$, $\log_{10}(2) \approx 0.3$

base 2: $2^3 = 8$, $\log_2(8) = 3$

decibels: $dB = 10 \log_{10}(\text{ratio})$

therefore $\text{ratio} = 10^{(dB / 10)}$

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Least Significant Bits

- In a register:
always the rightmost bit
- In a memory byte:
almost always the rightmost bit
- On a wire:
the *first* bit sent
- e.g. *Ethernet group address* bit
 - In memory: *rightmost* bit of *first* byte
 - On a wire: *first* bit sent

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Week 1

- 1.2: Terminology
 - Modes: simplex, duplex
 - Types: connectionless (packet switched), connection-oriented
 - Quality of Service
- 1.3: Communications Basics
 - Transmission modes: baseband, modulated
 - Media: copper, fibre
 - Transmission control: asynchronous, synchronous
 - Manchester (balanced) encodings
 - Framing: character- and bit-based
- 1.4: Protocol Basics
 - Idle RQ, link utilisation

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Week 2

- 1.4.3-1.4.9: Protocols
 - Continuous RQ, flow control, sequence numbers
 - Network layers
 - Protocol specification, service primitives
 - HDLC
 - IP stack
- 2.1: Telephone Network overview
- 2.2.1-2.2.1:
 - Analog lines
 - PSTN modems (overview only)

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Week 3

- 2.6 Internet Service Providers
 - Broadband modems (not ISDN modems)
- 2.6.4 PPP
 - Link protocol
 - Frame format
 - Byte stuffing using Escape character (01111101, 0x7D)
- A.2.1 Compression Principles

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Week 4

- A.2.2 Text Compression
 - Huffman coding
 - Lempel-Ziv (LZ) coding
 - A.2.3 Image Compression (overview only)
- B Error Detection
 - Parity
 - Block sum (longitudinal parity)
 - CRC
- C Error Correction
 - Hamming codes
 - Convolutional codes (overview only)

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Week 5

- 3.1, 3.2 LANs
 - Ethernet/IEEE802.3
 - Wiring configurations (10Base5, 10Base2, 10BaseT)
- 3.3 LAN Interconnection
 - Repeater hubs, bridging hubs, switching hubs
 - Transparent bridging
- 3.4 High-speed LANs
 - Fast Ethernet (100Base4T)
 - 8B6T, DC balance
 - 100BaseX, 4B5B encoding
 - Gigabit Ethernet
- 3.5 VLANs
 - IEEE 802.1Q

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Week 6

- 3.6 LAN Protocols
 - IEEE 802 protocols, media-independent interface
- Security
 - 10.1-10.2 Encryption, ciphers, DES, triple DES, RSA
 - 10.3 Nonrepudiation
 - 10.4.1 Public-key systems

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Week 7

- 10.4 Authentication
 - IPsec, IKE
- 10.7 Security
 - WEP, 802.11g, 802.11i, ...
- 10.8 Web Security
 - SSL
 - SET

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Week 8

- 4.1 Wireless Network types (PAN, LAN, cellular)
- 4.3 802.11
 - MAC layer, CSMA
 - Hidden Station, RTS/CTS extension
 - Moving hosts from one AP to another
- 4.4.1, 4.4.2 GSM
 - Logical structure, call forwarding
- 6.1, 6.4 IP Addressing
 - Class-based
 - CIDR
 - NAT

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Week 9

- 6.6.2 ARP
- 6.2 IP header format
- 6.3 Fragmentation and Reassembly
- Encapsulation, Routing
- 6.5 IP Routing
 - 6.5.4 Dijkstra's algorithm
 - 6.5.3 Bellman-Ford (Distance-Vector) algorithm
 - Hierarchical Routing

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Week 10

- Routing Protocols
 - RIP 6.5.3
 - OSPF, IS-IS 6.6.4
 - BGP 6.6.5
- 6.8 IPv6
- 7.1 Ports, port numbers
- 7.4 UDP
- 7.3.1 Sockets, socket programming

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Week 11

- 7.3 TCP
 - 7.3.2 TCP header layout, flags, Seq and Ack numbers
 - Opening a TCP session, 3-way handshake
 - Closing a session, 4-way handshake
 - Session shutdown, RST flag
 - Advertised Window tells how much free space in Rx buffer
- TCP data transfer
 - Sliding window, Ack number always indicates next byte expected
 - Sender resends segments that weren't received in proper order
 - Datagrams dropped in router queues = congestion
 - Sender varies congestion window to control congestion
- 6.6.9 ICMP, ping and traceroute
- 8.4 FTP

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Week 12

- 8.2 DNS
- 8.3 Email
 - (M)UA, MTA
 - SMTP
 - POP, IMAP
- 9.2 HTTP
- 6.6.3 DHCP

- 8.7 SNMP ***NOT in 2006 exam***
- VoIP, Internet Telephony ***NOT in 2006 exam***