

COMP 3331/9331:
Computer Networks and
Applications

Final Exam Review

Lecture Overview

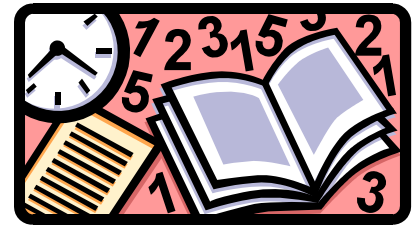
- What did we learn?
- **Final Exam Review**
 - Format of final exam
 - Important Concepts
 - Topics that need not be studied
 - Questions from previous exams
- Brief overview of Networks Research at CSE



What you have accomplished

- Comprehensive overview of the entire protocol stack with a particular focus on the Internet
- Key principles
 - Layering, scale, hierarchy etc
- Key design issues
 - Application architectures, reliability, congestion control, routing, medium access etc.
- Hands-on practical laboratory experiments using several diagnostic tools and Wireshark
- Two “real-world” assignments
 - Socket Programming
 - Routing

Final Exam Format



- This is a closed-book examination.
- Time allowed: 2 hours plus 10 minutes reading time
- Total number of questions: 8. You must answer all questions. Questions are of different value. Marks are as indicated.
- There are four sections. You are asked to answer each section in a separate booklet.
- The paper *must be returned* at the end of the examination.
- UNSW approved calculators are allowed.
- Write all answers in ink except where they are expressly required.
- Pencils may be used only for drawing, sketching or graphical work.

Final Exam Marks

- lab = marks for lab exercises (scaled to 20)
- assign = marks for the two programming assignments (scaled to 25)
- midExam = mark for the mid-semester exam (out of 20 marks)
- finalExam = mark for the final exam (out of **35** marks)
- mark = lab + assign + midExam + finalExam
- grade = HD|DN|CR|PS if mark ≥ 50 && finalExam ≥ 14 = FL if mark < 50 || **finalExam** < 14

Type of Questions

- No **True/False or multiple choice** questions
- There are also quite a few **short answer questions** based on critical analysis
- Focus on algorithms and fundamental concepts
- No essay style questions so please do not write LENGTHY RAMBLING ANSWERS
- Please indicate intermediate steps in problems. DO NOT directly write down the final answer. You will lose marks if you do so.
- Go through all the sample questions, tutorials, Problem Solving questions (OL), lecture Q&A, etc for practice
- *Nothing on programming or the lab exams*

Exam Sections (approx. allocation)

- ❑ Section 1 – Transport Layer (10 marks)
- ❑ Section 2: Network Layer and Routing (8 marks)
- ❑ Section 3: Link Layer (10 marks)
- ❑ Section 4: –Wireless/Mobile Networks and Security (7 marks)

- ❑ short answer questions, some may have parts (a,b,c)...
- ❑ *No question on Application Layer*
- ❑ **See sample exam paper and template in OL**

Past Exam Short Question (1)

- Q: When the traffic load on the LAN is very light, which of the following two MAC protocols: Token-passing protocol or Ethernet has a smaller delay? Explain briefly.
- A:

Past Final Short Exam (2)

- Assume that a group of 10 people wishes to communicate securely with each other. Each member of the group needs to send secret data to the other 9 people within the group. All communication between any two people p and q is visible to all other people in this group and no other person in the group should be able to decode their communication.
 - A) If the group decides to use symmetric key encryption, how many keys are required in the system as a whole?
 - B) Instead if public key encryption is chosen, how many keys would be required?

Past Final Short Exam (3)

- In 802.11 if sender senses channel to be busy, the sender backs off for a random time (based on exponential back-off)
- In Ethernet, if the sender senses channel to be busy, the sender keeps sensing the channel until it becomes free
- Why this difference?



Past Exam Question (1) - Solution

- Q: When the traffic load on the LAN is very light, which of the following two MAC protocols: Token-passing protocol or Ethernet has a smaller delay? Explain briefly.
- A: *Ethernet, since a node will almost always be able to transmit instantaneously. On a token ring, however, the node has to wait for the circulating token to arrive in order to begin transmission.*

Past Final Exam (2) Solution

- (a) If the group decides to use symmetric key encryption, how many keys are required in the system as a whole?

Each pair of people communicating would require their own unique key. For N people this comes out to $N(N-1)/2$. Hence, for $N=10$, we have 45. Alternate solution: The students may simply state that it is a summation of $9+8+7 \dots$ upto 1. This is fine too.

- (b) Instead if public key encryption is chosen, how many keys would be required?

For public key encryption, each user needs its own public private key pair. All the other users to send data to him can use the public key. So in this case, 10 pairs of public and private keys will be needed. (It is OK if they have stated 20 total keys are needed)

Past Final Exam (3)- Solution

In CSMA/CD (Ethernet)

Nodes that find channel busy keep constantly sensing the channel

Once channel is idle all of them would transmit

This could lead to collisions - but CSMA/CD uses collision detection
so relatively little wastage

In 802.11

No CD hence if the above process is followed a resulting collision
will waste the channel bandwidth significantly

Better to avoid collisions - hence we resort to backoff - CSMA/CA

What next?

- COMP 9332: Network Switching and Routing
- COMP 9334: Capacity Planning of Computer Systems and Networks
- COMP 4335/9335: Wireless Sensor and Mesh Networks
- COMP 4336/9336: Mobile Data Networks
- COMP6733 Internet of Things Design Studio
- COMP 4337/9337: Secure Wireless Networks
- COMP 3441/9441: Security Engineering
- Undergraduate/Postgraduate Projects and Thesis

Interested in Research with US

❑ Networked System and Security Group

- <https://www.engineering.unsw.edu.au/computer-science-engineering/research/research-activities/networked-systems-and-security-group-netsys>

❑ Cybersecurity and Privacy Lab

- <http://cyspri.web.cse.unsw.edu.au/>

Goodbye :(

- Hope you enjoyed the course
- Hope you learnt a lot
- Hope you know more about computer networks than you did 4 months ago
- Good Bye !!
- Good luck for the exam and the future
- Have a good break

