

PRINCE OF SONGKLA UNIVERSITY  
FACULTY OF ENGINEERING

**Final Examination:** Semester 1

**Academic Year:** 2005-2006

**Date:** October 10, 2005

**Time:** 09:00 – 12:00

**Subject Number:** 240-574

**Room:** R300

**Subject Title:** Special Topics in Information Network Engineering I  
(The Internet and its Protocols)

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**Exam Duration:** 3 hours

**This paper has 4 pages** (including this page).

**Authorised Materials:**

- Anything the student can carry, except for mobile phones.

**Instructions to Students:**

- *Answer questions in English.* Good English is **not** required.
- Write answers in an answer book.
- Start the answer to each question on a new page.
- **Clearly Number** the answers. It is **not** required that questions be answered in order.
- The marks allocated for each question are shown next to that question. There are 50 marks total for this examination. This will contribute 50% of the course total. Questions assigned higher numbers of marks expect a more detailed and thorough answer than questions allocated less marks.
- Answer enough of the 9 questions given so that you have answered questions totalling at least 50 marks. This will mean 3, 4, 5, or 6 questions.
- If you answer more questions than required, those answers that give you the best result will be retained, and others ignored. Should the marks for those questions total more than 50, the mark obtained for your weakest question that is included in your result will be scaled so as to make the total possible marks be 50.
- If you answer insufficient questions to generate 50 possible marks, the marks obtained for the questions answered will be the total.
- Anything illegible is incorrect.
- Answer briefly where possible, essays are **not** required.

**Question 1.***(10 marks)*

IPv6 altered the rules for IP fragmentation, compared to what they had been in IP version 4.

Explain what the differences are.

Why was the protocol changed regarding fragmentation?

**Question 2.***(15 marks)*

When upgrading a protocol, care should be taken to ensure that existing users of the old protocol can continue to operate, at least as well as they have in the past.

Give at least three (3) examples of protocol changes that have been made in any of the Internet Protocols, explain what issues there were with compatibility with older versions of the protocol, and how those compatibility issues were handled.

**Question 3.***(20 marks)*

Explain the security issues with the Neighbor Discovery (ND) protocol for IPv6 as it was originally designed. (That is, Neighbor Solicitations and Advertisements, and Router Solicitations and Advertisements – you can ignore the other ND packets for the purposes of this question.)

Contrast this with the Address Resolution Protocol (ARP) for IPv4. (That is, explain whether there are any new problems, any solved problems, related to security with ND, as compared with ARP.)

Explain how the use of Cryptographically Generated Addresses (CGA) can benefit ND.

Include in your answer an explanation of what can be deduced from correct use of a CGA in an ND packet, and what cannot.

What else, apart from using CGAs, is necessary to secure the ND protocol? What does this extra mechanism accomplish?

**Question 4.** (10 marks)

Why might a protocol designer use a grammar when designing a protocol?

What kinds (or types) of protocols are best suited to be designed using grammars, and which cannot easily be defined that way?

What other tools are available to a protocol designer to help specify a protocol clearly?

**Question 5.** (10 marks)

Explain the use of the CC option in TCP packets.

What benefit is (or benefits are) obtained from its use?

When is it most appropriate (or best) to use this option?

**Question 6.** (10 marks)

Explain why altering the service provider of a network (the ISP) may cause TCP connections that are open to fail.

What about TCP causes this to happen?

Why should altering the place of connection to the network (the service provider) cause this to be affected?

What could be altered, either in TCP or elsewhere, to avoid this problem?

What might be the side effects of such an alteration (or, why has this not already been done) ?

**Question 7.** (5 marks)

Explain the networking concept of a **tunnel**.

What is accomplished by the use of a tunnel, and what is required for a tunnel to be created?

**Question 8.**

*(15 marks)*

Imagine that you are to be responsible for the design of a new (or upgraded) version of a protocol (any protocol, you do not need to select a particular protocol).

Explain what information you would need (other than the existing protocol specification) and why you would need it?

What would it be useful to accomplish, or know, before starting the new/upgraded protocol design process?

**Question 9.**

*(5 marks)*

Explain the change made to the IP version 4 header *Time To Live* (TTL) field when IP version 6 was designed.

What changed, what did not change, and why were the changes made?

Were there any side effects in other protocols from this change?