

PRINCE OF SONGKLA UNIVERSITY
FACULTY OF ENGINEERING

Midterm Examination: Semester 1

Academic Year: 2006-2007

Date: August 1, 2006

Time: 09:00 – 12:00

Subject Number: 240-642

Room: A401

Subject Title: The Internet and its Protocols

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.
- Attempt all 5 questions.
- 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.
- Anything illegible is incorrect.
- Show all calculations, not just the final result.
- Answer briefly where possible, essays are **not** required.
- The marks allocated for each question are shown next to that question. There are 100 marks total for this examination. This will contribute 25% of the course total.

Question 1.*(40 marks)*

1. i) For TCP that is not using window scaling (that is: the window scale option is not present) copy the following table to your answer book, and complete the missing entries to show the (approximate) maximum possible TCP throughput (in bits/second) for each of the combinations of Round Trip Time (RTT) measured in milliseconds, and network bandwidth, measured in bits/second:

		Round Trip Time (<i>ms</i>)			
		0.5	1.0	20.0	128.0
Bandwidth <i>bits/sec</i>	128000				
	2000000				
	10000000				
	100000000				
	1000000000				

[20 marks]

1. ii) Indicate for which of the above combinations window scaling would assist in improving TCP's throughput, and which value of the window scale option would achieve best results. You can assume that there will not be a problem with memory for TCP buffers that might otherwise limit the maximum window size.

[5 marks]

1. iii) Explain the requirements for a host to use the window scaling protocol. That is, in what circumstances is it permitted for a host to scale the window size it sends to its partner host.

[5 marks]

1. iv) Explain a problem that might occur if the window scaling option was permitted to have a value of 15 or greater. Illustrate the problem using an example.

[10 marks]

Question 2.*(20 marks)*

2. i) Explain the purpose of **TIME WAIT** state in the TCP protocol connection management process. [10 marks]
2. ii) What mechanism does T/TCP add to TCP to allow some connections to avoid or shorten **TIME WAIT** state. [4 marks]
2. iii) Explain how that mechanism functions. [6 marks]

Question 3.*(10 marks)*

TFTP error packets contain both an error number, and a string explaining the cause of the error. Explain why both of these are present, and when, or where, each would be used.

Question 4.*(20 marks)*

The Internet Protocol checksum algorithm cannot detect the insertion or deletion of (16 bit) words of all zero bits, or all one bits, or detect cases where some (16 bit) words are re-ordered in a packet with respect to other (16 bit) words.

4. i) Explain why this is the case. [6 marks]
4. ii) Do you believe the internet protocol checksum algorithm is adequate for the protection of data crossing the internet?
Give reasons for your opinion. [14 marks]

not required to.

Explain the reason for this change of the option specification between IPv4 and IPv6.

Question 5.

(10 marks)

Options in an IPv6 Options header all contain an explicit length field.

Options in the IPv4 IP header mostly contain an explicit length field, but are not required to.

Explain the reason for this change of the option specification between IPv4 and IPv6.