PRINCE OF SONGKLA UNIVERSITY

FACULTY OF ENGINEERING

Midterm Examination: Semester 1 **Academic Year:** 2012-2013

Date: July 31, 2012 (2555) **Time:** 13:30 – 16:30

Subject Number: 242-643 **Room:** A301

Subject Title: The Internet and its Protocols

Name: _____ Student Number: _____

Exam Duration: 3 hours

This paper has 8 pages (including this page).

- Write the answers in the spaces provided in the examination paper.
- Clearly write your student number in the space provided at the top of each page. Write your name and student number in the spaces provided on this cover page.
- There are 80 marks total for this exam. This will contribute 20% of the course total.

Authorised Materials:

- Anything the student can carry (except communication devices.)

Instructions to Students:

- Attempt all 5 questions .
- Anything illegible is incorrect.
- Answer briefly where possible, essays are **not** required. There is no need to use all of the space provided for each answer!
- The marks allocated for each question are shown next to that question.
- *Answer questions in English.* Good English is **not** required.

For marker's use only.

1	2	3	4	5	Total

Question 1. *(10 marks)*

A) What does the UDP protocol add to the protocol stack that is not already provided by the IP protocol, over which UDP runs?
[3 marks]

B) What factors would lead an application to prefer to use UDP or TCP as its transport protocol?
[2 marks]

C) Which application types are likely to prefer one or the other?
[2 marks]

D) When and why might TCP for Transactions (T/TCP) be a better choice?
[3 marks]

Question 2. *(30 marks)*

The design of protocols such as TCP, and TFTP (and others) imposes an upper bound upon the rate at which data can be exchanged, which simply increasing the bandwidth of the path between the systems communicating cannot significantly alter.

A) Explain what it is about the protocols that causes this speed limit, and what factors influence its value.

[10 marks]

B) Explain how a protocol designer calculates the maximum rate at which the protocol can transfer data.

[5 marks]

C) What modifications are possible (and practical) to a protocol to allow the speed limit to be increased?

[5 marks]

D) To avoid this limit completely, and allow the maximum speed of a connection to be controlled only by the available bandwidth, some other features of the protocol will either need to be done in totally different way, or be dropped completely. What features are those, and why are they related this way?

[10 marks]

Question 3. *(10 marks)*

A) Give an example of a protocol where a scaling issue caused the protocol to be revised.

[5 marks]

B) Explain the issue (the original problem), and show how it has been overcome.

[5 marks]

Question 4. *(10 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.

Explain why this is the case.

Question 5. *(20 marks)*

A) Explain the role of the sequence number in the TCP 3-way handshake, used to initialise a new instantiation (instance) of a connection.

[4 marks]

B) Why is the 3-way handshake required?

[6 marks]

C) Are there any circumstances in TCP, or any TCP derived protocol, where the 3-way handshake can be avoided?

[2 marks]

D) Explain those circumstances and how TCP is made to operate correctly without the 3-way handshake.

[8 marks]