

PRINCE OF SONGKLA UNIVERSITY  
FACULTY OF ENGINEERING

**Final Examination:** Semester 2

**Academic Year:** 2007-2008

**Date:** February 29, 2008

**Time:** 09:00 – 12:00

**Subject Number:** 240-362

**Room:** A201

**Subject Title:** Internet Engineering

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**Exam Duration:** 3 hours

**This paper has 7 pages** (including this page).

- Write answers in the answer book provided.
- There are 175 marks total for this exam.  
This will contribute 35% of the course total.

**Authorised Materials:**

- Anything the student can carry (except mobile/cell phones.)

**Instructions to Students:**

- Attempt all 15 questions.
- **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 175 marks total for this examination.
- *Answer questions in English.* Good English is **not** required.

**Question 1.***(5 marks)*

Which items are true, which are false?

- A) The DNS uses both UDP and TCP as its transport layer protocols.
- B) In the DNS, a domain is always the same thing as a zone.
- C) The answer section in the DNS reply message must have only one resource record.
- D) In the DNS, each zone must be served by only one DNS server.
- E) The two domain names, “sc.coe.psu.ac.th” and “SC.COE.psu.ac.th” are the same name in DNS.

**Question 2.***(5 marks)*

Which of the following are information that we can ask from the DNS, and which are not?

- A) IP addresses of `www.coe.phuket.psu.ac.th`.
- B) Host name of the machine that has IP address `172.30.0.5`.
- C) Find which zones use `ns.psu.ac.th` as their nameserver.
- D) List of the IP addresses of the machines that have host names starting with “std”.
- E) The mail exchange for `psu.ac.th`.

**Question 3.***(10 marks)*

Zone transfer is the process used by the secondary DNS server to update its copy of zone data from the primary DNS server.

Answer the following questions about the query process of zone transfer.

- A) What is the difference between the query for a zone transfer and a general query for an IPv4 address?  
[5 marks]
- B) How does the secondary server know that its copy of zone data is out of date?  
[5 marks]

**Question 4.***(10 marks)*

One of the limitations of the DNS is that the size of a DNS message transmitted in a UDP packet should not be bigger than 512 bytes. This is not a problem for DNS query message because it has not much information (only one RR per query message). But it is possible for a DNS reply message to be bigger than 512 bytes.

Answer the following questions.

- A) When a DNS client receives a DNS reply message sent from a DNS server, explain how does it know that the reply message does not contain the complete answer? [4 marks]
- B) What does the DNS client do next in order to get the complete data of that DNS reply message? [6 marks]

**Question 5.***(20 marks)*

There is a web page, named *gallery.html*, located in a web server. This page contains 4 JPEG image files and 2 small Flash movie files.

Assume that you would like to browse this web page and the round trip time between your machine and the web server is 50 milliseconds.

Assume that each HTTP object is small and the transfer time of each object is very short (can be ignored).

Calculate the latency (time you have to wait) from submitting the web page request until you receive the complete page where your web browser uses each of the following methods:

- A) Non-Persistent Connection (Simple) [10 marks]
- B) Pipeline [10 marks]

**You must show how you calculated each answer.**

**Question 6.***(6 marks)*

In HTTP version 1.1, the request message requires not only the request line (command), but a header field, **Host**, is also required. Explain why this header field is required (by giving an example situation).

**Question 7.***(24 marks)*

Encryption techniques can be separated into two schemes, symmetric key encryption and public key encryption. In the case of a secure web page, these two techniques are both used.

The following incomplete list gives the security steps that a web browser uses to communicate with a web server in order to provide secure transmission of data from the web browser.

Complete the list by explaining the security processes performed by the browser or server (as indicated) in each of steps 2, 4 and 5.

**Step 1:** Client sends request to browser for a page, the page is returned, signed, together with a certificate containing the server's public key, with the certificate signed by a certificate authority.

**Step 2:** */\* The web browser does something here \*/*

**Step 3:** The user fills in a form in the secure page, often containing sensitive data (a password or credit card number, or similar) and presses a button to submit the form data.

**Step 4:** */\* The web browser does something here \*/*

**Step 5:** */\* The web server does something here \*/*

**Question 8.***(8 marks)*

E-mail can be encoded using the Multipurpose Internet Mail Extensions (MIME) to allow data other than ASCII (American English) text to be transported.

Explain why it was necessary to invent this standard method to carry other data as e-mail.

Note: this does **not** mean you should explain why people would want to use e-mail for other than ASCII text, you can assume there are good reasons for that.

Instead explain why a standard method is used, rather than each system simply sending whatever it desires in the body of the e-mail.

application?

[6 marks]

- B) Does the use of the playout buffer increase the apparent delay to the application, or decrease the delay, or have no effect on the delay at all?

[3 marks]

**Question 9.***(20 marks)*

Answer the following questions about multicast routing.

- A) MOSPF is a multicast routing protocol that is rarely used. What is the main disadvantage of this protocol? [5 marks]
- B) What is the main objective of using reverse path forwarding (RPF) in multicast routing? [5 marks]
- C) What is the difference in the use of the IP header in routing multicast packets (with Reverse Path Forwarding) compared with routing simple unicast packets? [5 marks]
- D) What is the advantage of adding the flood and prune technique to the reverse path forwarding method? [5 marks]

**Question 10.***(18 marks)*

Use **time-line** diagrams to explain the passing of responsibility from a sending Mail Transfer Agent (MTA) to the receiving MTA when using the Simple Mail Transfer Protocol.

[10 marks]

Explain why the concept of **Responsible MTA** is important to the SMTP protocol. As part of this explanation, indicate what might occur if the concept did not exist.

[8 marks]

**Question 11.***(9 marks)*

- A) What purpose is served by the use of a playout buffer in a real time application? [6 marks]
- B) Does the use of the playout buffer increase the apparent delay to the application, or decrease the delay, or have no effect on the delay at all? [3 marks]

**Question 12.***(10 marks)*

There are 4 TCP connection usage methods for browsing a web page that we have discussed in this course. They are Non-Persistent Connection (Simple), Persistent Connection, Parallel Connection and Pipeline. Answer the following question about this issue.

There is a header field in the HTTP response message, **Content-Length**, which tells the number of bytes of data that follow in the body of message.

Which of the four browsing methods mentioned above **require** use of this header field, and which do not? Why?

**Question 13.***(10 marks)*

A) Explain why enhanced Quality of Service (QoS) might be needed by some Internet applications. That is, what about the *normal* Internet is unsuitable for those applications.

[2 marks]

B) Give some examples of results (network behaviour) an application might be seeking to achieve when it makes a request for some particular QoS.

[4 marks]

C) What is the basic mechanism (or functionality) the network (the routers in the network) can alter to attempt to provide QoS requested by applications.

[4 marks]

**Question 14.***(8 marks)*

Which of TCP, UDP, SMTP or Quality of Service (QoS) is the mechanism or protocol best suited to provide for each of the following:

- A) The lowest possible delay through the network for chosen packets, even if other packets arrive more slowly.
- B) Simple, small, query/response type transaction services.
- C) High bandwidth (that is, fast) data transfer for a large volume of data that needs to be delivered correctly.
- D) Ordered packet delivery.

**Question 15.***(12 marks)*

Which of the following statements do you agree with, and which do you disagree with? In each case, indicate whether you agree or disagree, and **give reasons** for your decision. Without reasons, your opinion is worthless, and will be marked that way!

You may expand upon the statements below (add more detail) if that will help your answer.

- A) Quality of Service cannot be achieved over the Internet.
- B) A Certificate Authority can be automated, issuing certificates to anyone who submits a request.
- C) E-mail security is rarely used in practice as most users do not need their e-mail to be secure.
- D) HTTP (the Web) is the most important application run over the network, as without it, no-one would care about the network.