PRINCE OF SONGKLA UNIVERSITY

FACULTY OF ENGINEERING

Midterm Examination: Semester 2 **Academic Year:** 2009-2010

Date: December 19, 2009 **Time:** 09:00 – 12:00

Subject Number: 241-461 **Room:** A401

Subject Title: Internet Engineering

Name: _____

Student Number: _____ Signature: _____

Exam Duration: 3 hours

This paper has 7 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, student number, and sign, in the spaces provided on this cover page.
- There are 60 marks total for this exam.

Authorised Materials:

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

Instructions to Students:

- Attempt all 6 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. There are 60 marks total for this examination.
- *Answer questions in English.* Good English is **not** required.

For marker's use only.

1	2	3	4	5	6	Total

Question 1. *(5 marks)*

Which claims about the Domain Name System (DNS) are true, and which are false?
(Write **T** *or* **F** *in each box provided)*

A) ☐

The DNS can be asked: What are the IP addresses for fivedots.coe.psu.ac.th ?

B) ☐

The answer section in the DNS reply message must have only one Resource Record.

C) ☐

The DNS can be asked: What is the hostname associated with IP address 172.30.130.164 ?

D) ☐

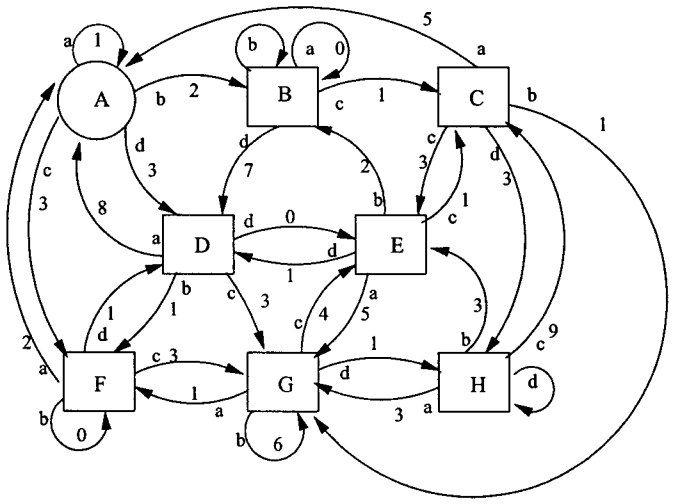
The two domain names, "coe.psu.ac.th" and "coe.PSU.AC.TH" always represent the same node in the DNS name tree.

E) ☐

The DNS can be asked to list hostnames of machines (computers) that have IP addresses starting with 172.30.

Question 2. *(12 marks)*

Examine the finite state machine (FSM) diagram given below, and use it to answer the questions that follow.



There are 8 states, labelled **A**, **B**, ... **H**. State **A** (drawn as a circle) is the start state.

There are 4 input events, labelled **a**, **b**, **c** & **d**.

Each state has a transition for each input event, the transitions are shown as arrows on the diagram, with the arrow head (pointer) at the new state, and with input event that causes that transition shown near where the label leaves the current state.

There are 10 output events, labelled as the digits **0**, **1**, ... **9**. An output event may be associated with a transition, in which case the digit representing the output event will be shown next to the transition arrow. Not all transitions produce output, if no output is produced, the transition arrow will have no digit next to it.

A) With the FSM initially in state **A**, write in the boxes below the later states that will be entered if the following input sequence is received.

b a c c d c d d b d a

A ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐

B) With the FSM initially in state **A**, write in the boxes below the shortest sequence of input events that will produce the output events shown:

1 2 0 7 0 5 6 1 9 5 3 8

☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐

Question 3. *(10 marks)*

On one TCP connection, between port 1123 on host A, and port 8097 on host B, host A sends to B

SYN=1, ACK=0, RST=0, Seq=2468, Ack=X, Src port=1123, Dst port=8097

at about the same time as host B sends to A

SYN=1, ACK=0, RST=0, Seq=98765, Ack=X, Src port=8097, Dst port=1123

When B receives the first of those, and A receives the second, each will send a packet to the other in reply.

Those packets will be *(fill in the values in the boxes)*:

From A to B, Src port=1123, Dst port=8097,

SYN= ☐

ACK= ☐

RST= ☐

Seq= ☐

Ack= ☐

From B to A, Src port=8097, Dst port=1123,

SYN= ☐

ACK= ☐

RST= ☐

Seq= ☐

Ack= ☐

Question 4. *(4 marks)*

Here are some statements relating to the HTTP protocol. Each statement might provide the answer to one of the questions that follows.

a) A Web server can be a server for many different (virtual) domains
b) The TCP Initial Sequence Number (ISN) is selected to so problems with old duplicate packets can usually be avoided
c) Different content can be returned depending upon the preferences of the user
d) A Content-Type Header element is returned in the meta-data before the file content
e) The system that first closes a TCP connection enters TIME-WAIT state for twice the maximum segment lifetime (several minutes usually)
f) The file name contains an extension like .jpg or .doc

For each of the following questions, find the statement above that best answers the question, and write the letter beside the statement in the box next to the question it answers.

☐ A) How does HTTP know what kind of data is returned when it requests the data that is at a URL? That is, the data might be a web page, or an image, or audio data (sound), or ... How does the browser (or other HTTP client) know what kind of data exists?

☐ B) When the file transfer part of an HTTP request is finished, the server (usually) closes the connection, which tells the client (or browser) that there is no more data. What feature of TCP can cause this to be a problem for a server that is handling requests from thousands of clients?

☐ C) A web browser (or other HTTP client) must identify itself to the server. It informs the server of its software version, and other characteristics of the browser, or its user, such as what are the preferred languages. Why is this necessary?

☐ D) HTTP version 1.0 sent just the path name part of a URL to the server as part of the GET request. HTTP version 1.1 is the same, but it also sends the hostname part of the URL as an additional header after the GET request. Why was this change made?

Question 5. *(14 marks)*

Imagine an E-Mail client Mail Transfer Agent (MTA) attempting to transfer a message to a server MTA. The client connects to the server, and begins the SMTP *(Simple Mail Transfer Protocol)* transaction. During the protocol exchange, the server replies with a **4nn** (temporary error) code to one of the recipient addresses.

A) Give some example reasons (at least 3) why the server MTA might reply with a temporary error code when asked to deliver a message to a particular recipient.

[5 marks]

B) Explain the actions of the client MTA when it receives this error response, both upon the remainder of the current SMTP connection, and how it deals with the message in the future.

[9 marks]

Question 6. *(15 marks)*

There are 4 sections of Resource Records (RR) in each DNS message. They are the **question, answer, authority** and **additional** sections. When a resolver would like to send a DNS query message to a DNS server, it can add only one RR in the question section. This is one of DNS limitations.

Explain why the resolver cannot put more than one RR in the question section of a DNS query message.