PRINCE OF SONGKLA UNIVERSITY

FACULTY OF ENGINEERING

Final Examination: Semester 2 **Academic Year:** 2004-2005

Date: February 25, 2005 **Time:** 13:30 – 16:30

Subject Number: 240-362 **Room:** Robot Head

Subject Title: Internet Engineering

Exam Duration: 3 hours

This paper has 7 pages (including this page).

- This exam is divided into two parts.
- The first part should be answered in the **yellow** answer book, and the second part in the **blue** answer book.
- There are 80 marks total for this exam, 70 marks are from part 1, the remaining 10 marks from part 2.

Authorised Materials:

- Anything the student can carry.

Instructions to Students for Part 1:

- *Answer questions in English.* Good English is **not** required.
- Attempt all 7 questions.
- Write answers in the **yellow** 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.
- Answer briefly where possible, essays are **not** required.
- The marks allocated for each question are shown next to that question. There are 70 marks total for this part of the examination.

Question 1. *(9 marks)*

The trees used to name objects for Network Management (the Management Information Base, or MIB) and for the Domain Name System (DNS) are quite similar. They each contain an unnamed root node, and each node can contain an undetermined number of sub-nodes (or child nodes). Data of various types is present in the tree, and is available for fetching by clients running the appropriate protocol.

Give **three** (3) differences between the MIB tree and the DNS tree. Ensure that the differences in your answer are not just variations of the same thing. Note that differences between the DNS and SNMP protocols used to access the data are not relevant to this question, only differences between the object trees that are accessed by those two protocols.

Question 2. *(10 marks)*

Which of the following five (5) statements about multicast are correct, and which are incorrect? For each incorrect statement, briefly explain why the statement is incorrect.

A) A sender of multicast packets must join the multicast group before sending packets to it.

B) Multicast is not suitable for TCP sessions.

C) Multicast packets are transmitted to a multicast router on the sender's link (ethernet) to be forwarded to members of the group.

D) A multicast router will know the identities of all members of multicast groups on links connected to it.

E) Multicast routers can forget which links should be **pruned** for a particular group without harming the correctness of the protocol.

Question 3. *(10 marks)*

The path vector protocol used by BGP allows systems to implement policies on what routes are exchanged with peer routers. Explain why this is useful, and explain why the Distance vector (eg: RIP) and Link State (eg: OSPF) protocols cannot make these sorts of policy adjustments to the routing information.

Give reasons why this restriction on protocols like RIP or OSPF is important, or is not important (whichever you believe is correct)?

Question 4. *(8 marks)*

HTTP and SMTP are both primarily file transfer protocols. HTTP transfers a file (web page) from a web server to the client, whereas SMTP transfers a file (e-mail message) from the client to the mail server (MTA).

Describe the differences and the similarities of these two protocols (HTTP and SMTP).

What, in your opinion, is the most significant functional difference (that is, the difference in what the protocol is required to accomplish) between these two application protocols? Explain why this difference is important.

Question 5. *(7 marks)*

Briefly describe how IPv4 and IPv6 nodes can obtain the network configuration information they need to be able to successfully use the network.

There is no need to include details of any protocols that you mention, but you should give an overview of how the protocol works (to allow hosts to obtain configuration information).

Question 6. *(10 marks)*

List the major security related steps that a web client and server perform in order to allow secure (private, or secret) communications of data from a web client (browser) to the web server.

Include in your answer information about what security related data needs to be exchanged, how that data can be verifi ed (or checked for accuracy and honesty) and in what order are the steps carried out?

Question 7. *(16 marks)*

Examine the code fragment on the following page. Note that this fragment is not a complete program. Explain what the code does (its purpose, or function). Describe the purpose of the major variables, and parameters, used by the code, and the data types of those variables.

make_it

```
int
make_it(int family, int command)
{
        int s;
        int port;
        int n;
        struct sockaddr_storage me;
        static struct in6_addr in6_any = IN6ADDR_ANY_INIT;

        s = socket(family, SOCK_STREAM, 0);
        if (s < 0)
                return -1;

        me.ss_family = family;
        switch (family) {
        case PF_INET:
                me.ss_len = sizeof (struct sockaddr_in);
                ((struct sockaddr_in *)&me) -> sin_addr.s_addr = INADDR_ANY;
                break;
        case PF_INET6:
                me.ss_len = sizeof (struct sockaddr_in6);
                ((struct sockaddr_in6 *)&me) -> sin6_flowinfo = 0;
                ((struct sockaddr_in6 *)&me) -> sin6_addr = in6_any;
                ((struct sockaddr_in6 *)&me) -> sin6_scope_id = 0;
                break;
        default:
                fprintf(stderr, "Impossible family (%d) - abort\n", family);
                break;
        }

        n = 0;
        do {
                port = rand() % 9876 + 25000;

                switch (family) {
                case PF_INET:
                        ((struct sockaddr_in *)&me) -> sin_port = htons(port);
                        break;
                case PF_INET6:
                        ((struct sockaddr_in6 *)&me) -> sin6_port = htons(port);
                        break;
                }
        } while (bind(s, (struct sockaddr *)&me, me.ss_len) < 0 && ++n < 20);

        if (n >= 20) {
                close (s);
                return -1;
        }

        if (listen(s, 1) < 0) {
                close (s);
                return -1;
        }

        add_rd_poll(s, command);
        return (port);
}
```

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Subject Title: Internet Engineering (Part 2)

Instructions for Part 2 of the Exam

Authorised Materials:

- Anything the student can carry.

Instructions to Students:

- Attempt all 2 questions in this part.
- Write answers in the **blue** 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.
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- The marks allocated for each question are shown next to that question. There are 10 marks total for this part of the exam.

Question 8. *(6 marks)*

Suggest mechanisms at both the client/server ends of, and inside, the network that would work together to give the acceptable QoS support for running multimedia applications over the best-effort Internet.

Question 9. *(4 marks)*

What is the scalability problem found in the Integrated Services Internet (IntServ) and how can it be avoided in the Differentiated Services Internet (DiffServ)?