PRINCE OF SONGKLA UNIVERSITY
FACULTY OF ENGINEERING

Final Examination: Semester 2   **Academic Year:** 2003-2004

Date: February 26, 2004   **Time:** 13:30 – 16:30

Subject Number: 240-426   **Room:** R300

Subject Title: Unix Network Programming

Exam Duration: 3 hours

This paper has 4 pages (including this page).

Authorised Materials:

- Anything the student can carry.

Instructions to Students:

- *Answer questions in English.* Good English is **not** required.

- Attempt all 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.

- 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 30% of the course total.

Question 1.   *(10 marks)*

What is a **Well Known Port Number**?

How would a program often be written if it is to use a well known port?

Explain the most common way a port number that is **not** well known would be used.

Question 2.   *(5 marks)*

The *setsockopt* system call has a **level** parameter. Explain the meaning of that parameter? That is, what is its purpose, and how is it used?

Question 3.   *(15 marks)*

What is **Out Of Band** data?

What is its purpose in network protocols?

How would a **UNIX** application program transmit out of band data when using TCP? (You can use some brief sample C code as part of the explanation if desired.)

Question 4.   *(15 marks)*

Explain the **accept***(2)* system call. What is its function? What effects does it have upon the program?

The value of N in the following code fragment can be 0 or 1 (zero or one).

```
int value = N;
(void) ioctl(sock, FIONBIO, &value);
```

If the socket (*sock*) in the code fragment shown is later used as the socket argument (first argument) to an **accept** system call, what difference (if any) would it make to the operation of that **accept** call if the value of the **N** constant in the code fragment was 0 or 1?

Question 5.   *(20 marks)*

A program includes the following code:

/ assume all necessary .h files have been included */*

```
    int s, pid;
    int on = 1;

    s = socket(dest->sa_family, SOCK_STREAM, 0);

    pid = getpid();
    (void)ioctl(s, FIOSETOWN, &pid);
    (void)ioctl(s, FIOASYNC, &on);
    (void)signal(SIGIO, io_sig_handler);
```

Explain what the program is intending to accomplish with this code
sequence.

Write the function *io_sig_handler* which might be used together with the
code shown.

Explain how your function would operate with the rest of the program
(which is not shown, and which you do **not** have to write).

Question 6.   *(15 marks)*

A program using SOCK_STREAM (TCP) sockets, performs the following 3
write system calls, and only these (since the connection was established):

```
        write(sock, "hello", 5);
        write(sock, " ", 1);
        write(sock, "there.", 6);
```

The peer to the above program, that is, the partner program it is
communicating with, after receiving the incoming connection, performs the
following **read** system call:

```
    char buffer[200];
    n = read(mysock, buffer, 200);
```

What values for *n* (the result from the **read** system call) are possible here?

What might the different return values indicate?

Question 7.   *(10 marks)*

Explain the use of **pseudo-terminals** (*pty*) in networking operations.

Why is it sometimes necessary to use a pseudo-terminal (pseudo-tty)?

Which kinds of network applications are most likely to require to use pseudo-terminals?

Question 8.   *(10 marks)*

It is possible to use the **connect** system call on a socket that was created as **SOCK_DGRAM**. That is, a datagram socket, which by definition, selects a protocol which does not use connections (such as UDP).

What is achieved by using **connect** on a datagram socket?

That is, why would some programs perform this operation?