PRINCE OF SONGKLA UNIVERSITY

FACULTY OF ENGINEERING

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

Date: December 23, 2003 **Time:** 13:30 – 16:30

Subject Number: 240-426 **Room:** A400

Subject Title: Unix Network Programming

Exam Duration: 3 hours

This paper has 3 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 10% of the course total.

Question 1. *(10 marks)*

When is should a **struct sockaddr_storage** be used when writing network programs?

What is the purpose of this data type? (That is, why does it exist at all in Unix systems?)

Question 2. *(15 marks)*

Explain the purpose of the **hints** parameter in the *getaddrinfo()* C library function.

When is it not required to be used?

Question 3. *(20 marks)*

Does the following C code fragment do anything useful?

If so, what does it do?
If not, why not?

```
/* assume all necessary .h files have been included */
xmit(struct sockaddr *dest, char *buffer, int buflen)
{
    int s;
    int len;
    s = socket(dest->sa_family, SOCK_STREAM, 0);
    if (s < 0)
        error_exit();  /* this function exists elsewhere */
    while (buflen > 0) {
        len = sendto(s, buffer, buflen, 0,
                dest, dest->sa_len);
        if (len < 0)
            error_exit();
        buflen -= len;
        buffer += len;
    }
}
```

Question 4. *(10 marks)*

Why do the **ntohl()** and **htonl()** functions (or macros) (and the corresponding versions for 16 bit data) need to exist?

When should those functions (or macros) be used when writing networking code?

Question 5. *(20 marks)*

White a short piece of example C code: A function that uses the *ioctl* command **FIONREAD** to determine which of two socket descriptors (or file descriptors) **d1** and **d2**, which are arguments (parameters) to the function, can be safely read without blocking the application.

The function should return the value of a descriptor which is OK to read, or −1 if neither descriptor is ready. If both descriptors are ready, return either one.

Question 6. *(15 marks)*

The **select** and **poll** system calls are used for the same purpose.

Explain the differences between those two system calls, and when each might be the better choice to use.

Give an example of a type of application that might use either one of those system calls.

Question 7. *(10 marks)*

What is an **address family**?

Give two examples of uses of address families in data structures, or system calls, that you have studied.

Assume that in the examples you gave, the address family did not exist — what effect would that have, in each case, on the usefulness of the data structure or system call?