KIMATHI UNIVERSITY COLLEGE OF TECHNOLOGY

University Examinations 2010/2011

THIRD YEAR SEMESTER I EXAMINATION FOR THE DEGREE OF **BACHELOR OF SCIENCE COMPUTER SCIENCE**

ICS 2305: SYSTEMS PROGRAMMING

DATE: 18th August 2010 TIME: 2 – 4 pm

Instructions: Answer Question 1 and Any Other Two.

Question 1

(a) Define the following terms
- (i) Systems programming
- (ii) System call
- (iii) Shell
- (iv) Device driver

(8 marks)

(b) C programming language is an appropriate language for systems programming. Explain.

(4 marks)

(c) (i) What is a socket in systems programming?

(2 marks)

(ii) List the steps used to accomplish a logical connection on the server-side in a connection-oriented paradigm, and include the functions used to do so in each step.

(6 marks)

(d) Explain the difference in the use of the following memory management functions, and give the general syntax for each.
- (i) malloc()
- (ii) realloc()
- (iii) calloc()
- (iii) free()

(8 marks)

(e) What is a zombie process?

(2 marks)

Question 2

(a) Discuss the following terms and state how they affect the performance of a system using some valid examples

(i) process

(ii) thread

(6 marks)

(b) Describe four instances where threads are used in real world applications.

(8 marks)

(c) (i) What is a process ID?

(2 marks)

(ii) Write a single statement, for each case, that will obtain the process ID for the following.

- Currently running process
- Parent process

(2 marks)

(d) What is a fork system?

(2 marks)

Question 3

(a) Describe two examples of preprocessor directives used in C programming.

(4 marks)

(b) A signal is used to handle synchronization of processes

(i) What normally generates signals?

(2 marks)

(ii) Explain the work of the following functions used in signal handling

- signal()
- int kill(int pid, int sig)

(4 marks)

(c) (i) Describe three special file streams that are defined in the *stdio.h* header.

(3 marks)

(ii) Use the following code to answer the questions below it:

```
#include <stdio.h>
int main()
{
   const int MAXLEN=1000;
   char readline[MAXLEN];
   fgets (readline,MAXLEN,stdin);
   printf ("You typed %s",readline);
   return 0;
}
```

- Briefly explain the use of *fgets* and *stdin* in the code above

(4 marks)

- What is the output of the program after execution.

(3 marks)

Question 4

(a) Explain how the following facilities help to diagnose system call errors, using examples.
   (i) errno
   (ii) perror()
   (iii) strerror()

(6 marks)

(b) Define the following terms
   (i) IPC
   (ii) pipes

(2 marks)

(c) (i) Describe the main limitations of pipes and how to overcome them.

(6 marks)

   (ii) Explain the work of the pipe() function

(2 marks)

(d) State the use of the following files in creating a DLL in C++ programming language.
   (i) .def file
   (ii) header file

(4 marks)

Question 5

(a) Describe, using a diagram, the steps that a program code undergoes during execution.

(8 marks)

(b) Explain the tasks performed by the following UNIX functions, outlining the significance of each parameter used.
   (i) fseek(FILE * stream, long offset, int whence)
   (ii) int fread(int fildes, char *buf, unsigned nbyte)

(4 marks)

(c) Differentiate the following terms as used in systems programming
   (i) loader and linker
   (ii) dynamic linking and static linking

(8 marks)