



DUBLIN INSTITUTE OF TECHNOLOGY

DT228 BSc. (Honours) Degree in Computer Science

Year 4

SUMMER EXAMINATIONS 2016/2017

SYSTEMS SOFTWARE [CMPU4051]

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THURSDAY 18TH MAY

1.00 P.M. – 3.00 P.M.

TWO HOURS

ANSWER QUESTION (1) AND *ANY TWO* OF QUESTIONS (2), (3), (4)

QUESTION (1) IS WORTH **40** MARKS.

QUESTIONS (2), (3), (4) ARE WORTH **30** MARKS EACH

Question 1

1. a) Discuss Eric Raymond's "Rule of Separation" and how this relates to software design and implementation in a Unix environment. (5 marks)
1. b) Explain the main benefits of using a makefile in a large commercial project. (5 marks)
1. c) Using fork and exec create a C program to allow a process to create another process that runs the ps -jx command. (5 marks)
1. d) Explain what a zombie process is and how a zombie process can be created using a C program. (5 marks)
1. e) What is a process group leader? Describe in detail how a process becomes a group leader and how to identify a process group leader. (5 marks)
1. f) "A socket endpoint is represented as a file descriptor". Describe how the read and write functions can be used to communicate with a socket. (5 marks)
1. g) Discuss the main differences between User threads and Kernel Threads. (5 marks)
1. h) "Mandatory file locking doesn't require cooperation from the participating processes". Explain this statement and use an example to compliment your answer. (5 marks)

Question 2

2. a) Describe the main differences between an unnamed pipe and a named pipe. (5 marks)
2. b) A process calls pipe then calls fork and creates an IPC channel from the parent to the child. Describe in detail how the parent communicates with the child process. Use a diagram to compliment your answer (10 marks)
2. c) Create a C program using pipes to offer the same output as the following command:
`ps -aux | grep login`. Describe in detail each aspect of the program. (15 marks)

Question 3

3. a) Write a C program that creates two threads.
One thread starts a function that displays the following messages:
Hello from thread 1
Goodbye from thread 1

The second thread starts a function that displays the following messages:
Hello from thread 2
Goodbye from thread 2

When the program runs and the threads start it should produce the output in the following sequence:
"Hello from thread 1"
"Goodbye from thread 1"
"Hello from thread 2"
"Goodbye from thread 2"

Describe in detail each aspect of the program. (15 marks)
3. b) When a signal is received, the process needs to tell the kernel how to proceed. Describe the options a program may take after receiving a signal. (15 marks)

Question 4

4. a) Briefly explain why a Debugging Symbol Table is important when using GDB to debug an application. How can a C program be compiled to ensure the Debugging Symbol Table is included?

(10 marks)

4. b) Create a makefile to represent the following:

Variables:

- **CC** to hold the compiler type
- **objects** to hold a list of the common objects
- **headers** to hold a list of the common headers

The final executable should be called webTransfer.

The program is made up of the following .c files and .h files with the following dependencies:

- main.c (includes all headers)
- identifyModified.c
- transferFiles.c (includes identifyModified.h)
- ftpTransfer.c

The makefile clean option should delete all executables in the project.

(20 marks)