DUBLIN INSTITUTE OF TECHNOLOGY

BSc. (Honours) Degree in Computer Science

BSc. (Honours) Degree in Computer Science (International)

Year 1

SUMMER EXAMINATIONS 2014/2015

OPERATING SYSTEMS 1 [CMPU1022]

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TUESDAY 19TH MAY   9.30 A.M. – 11.30 A.M.

TWO (2) HOURS

ANSWER ANY **THREE (3)** QUESTIONS OUT OF **FOUR (4)**.

NOTE: QUESTION (1) ONE CARRIES 40 MARKS,
ALL OTHER QUESTIONS CARRY 30 MARKS.

1. **(a)** Explain what is meant by *the Fetch-Decode-Execute cycle*.

(5 Marks)

1. **(b)** Briefly describe what is meant by the term *von Neuman Architecture*.

(5 Marks)

1. **(c)** The Little-Man Computer provides an analogy for the execution of a computer program, explain what each of the following represent in a real computer:

    (i) The Pigeon-holes

(2 Marks)

    (ii) The In-Tray

(2 Marks)

    (iii) The Program Counter

(2 Marks)

    (iv) The Calculator

(2 Marks)

    (v) The Out-Tray

(2 Marks)

1. **(d)** The Little Man model uses a single-digit op-code and a 2-digit memory addressing and has the following instructions defined where the address portion is shown as xx

OpCode	Instruction	Description
1xx	ADD	Add the value of a given memory location to calculator
2xx	SUBTRACT	Subtract the value of a given memory location to calculator
3xx	STORE	Copy the value from the calculator into a given memory location
5xx	LOAD	Copy the value from a given memory location into the calculator
6xx	BRANCH	Unconditional branch. Set the Program Counter to value xx
7xx	BRANCH IF ZERO	Conditional branch. If the accumulator is zero, branch to xx
8xx	BRANCH IF POSITIVE	Conditional branch. If the accumulator is positive, branch to xx
901	INPUT	Get the value from the IN-TRAY and put it into the calculator
902	OUTPUT	Put the value in the calculator into the OUT-TRAY
000	HALT	Take a break

Write a program using these codes to take two numbers which are contained in the IN-TRAY and display the sum (+) of those numbers in the OUT-TRAY. Comment every instruction

(20 Marks)

2. **(a)** What do the following DOS commands do:

(i) dir

(2 Marks)

(ii) path

(2 Marks)

(iii) help

(2 Marks)

(iv) echo

(2 Marks)

(v) tree

(2 Marks)

2. **(b)** What do the following Linux/Bash commands do:

(i) cat

(2 Marks)

(ii) clear

(2 Marks)

(iii) pwd

(2 Marks)

(iv) ls

(2 Marks)

(v) man

(2 Marks)

2. **(c)** Write a DOS Batch script to automatically recursively backup files from a specified directory (and all its sub-directories), to a newly create directory called BackupFolder (with the same sub-directories). Finally list all the files recursively in the new BackupFolder.

(3 Marks)

Suggest a name that you would give to the file with the instructions in it?

(1 Mark)

What would you type in to the command prompt to execute it?

(1 Mark)

2. **(d)** Write a Bash/Linux script to automatically recursively backup files from a specified directory (and all its sub-directories), to a newly create directory called BackupFolder (with the same sub-directories). Finally list all the files recursively in the new BackupFolder.

(3 Marks)

Suggest a name that you would give to the file with the instructions in it?

(1 Mark)

What would you type in to the command prompt to execute it?

(1 Mark)

3. **(a)** Explain the following data structures, including in each explanation a diagram:

    (i) A Queue

                       (2 Marks)

    (ii) A Stack

                       (2 Marks)

    (iii) A Heap

                       (2 Marks)

3. **(b)** Explain the purpose of the *Job Scheduler*.

                       (6 Marks)

3. **(c)** What are the five (5) statuses a process can have, and what transitions are permissible between states. Illustrate your answer with a diagram, and an explanation of each state.

                       (9 Marks)

3. **(d)** What are the fields in the *Process Control Block* (PCB)? Provide an explanation for each field.

                       (9 Marks)

4. (a) What is *Deadlock*? Discuss four (4) types of deadlock.

(5 Marks)

4. (b) What does the File Manager do?

(5 Marks)

4. (c) Discuss the following physical file storage allocation schemas:

(i)   Contiguous Storage

(5 Marks)

(ii) Non-contiguous Storage

(5 Marks)

(iii) Indexed Storage

(5 Marks)

4. (d) What is an *Access Control Matrix*? Include an example in your answer.

(5 Marks)