National College of Ireland

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BSc (Hons) in Computing – Full-time - BSHC1
BSc (Hons) in Computing – Part-time – Year 1 - BSHCE 1
BSc (Hons) in Business Information Systems – Full-time – Year 1 - BSHBIS1
BSc (Hons) in Business Information Systems – Part-time – Year 1 - BSHBISE1
Higher Certificate in Science in Computing Applications and Support – Full-time – Year 1 - HCC1
Higher Certificate in Science in Computing Applications and Support – Part-time - Year 1 - HCCE1
BA in Management of Technology in Business – Full-time – Year 1 - BAMTB1

Semester Two Examinations – 2010/11

Friday 13th May, 2011
10:00am – 11:30am

Computer Architecture

Dr. Tom Nolan
Dr. Thomas Newe
Mr. Ciaran O Leary
Dr. Keith Maycock

Answer **any** two questions

Duration of exam: 90 minutes
Attachments: Boolean Algebra Identities

Question One: You must show process of number conversions

a. Convert the following Binary numbers into Decimal numbers: 110, 001, and 1101. **(15 marks)**

b. Convert the following Octal numbers into Binary numbers: 23, 11, and 7. **(15 marks)**

c. How many bits are required to represent a Hexadecimal number? **(5 marks)**

d. How many nibbles does it take to represent FFFF? **(5 marks)**

e. Discuss the advantages of assembly programming in comparison to higher level languages like Java. **(10 marks)**

Question Two

a. What does the instruction li $v0, 10 do in the following program? **(5 marks)**

b. The program below contains 3 errors. What are they ? Rewrite the code from the label __start to the last syscall highlighting clearly the 3 corrections you have made. **(15 marks)**

c. Add comments to the program. **(5 marks)**

```
##
## Print a fixed string out 10 times
##
        .text
        .globl __start
        __start:

        addi $t0, $t0, 5
        loop:
                la $a0, strToPrint
                li $v0, 1
                syscall

                addi $t0, $t0, 1
        bnez $t0, loop
        li $v0, 10
        syscall
    .data
    strToPrint: .asciiz "The string to print\n"
```

d. List three ways to improve CPU performance. **(9 marks)**

e. What is meant by core voltage? **(6 marks)**

f. Differentiate between two different cooling systems that you have studied. **(10 marks)**

Question Three

Congratulations you have just started working for Intel earning over 100,000euro a year. Intel are about to start manufacturing the following circuit, expressed as a function,

$$F = \overline{X}Z + \overline{X}Y\overline{Z} + XZ$$

The circuit represents a new function for location based technologies.

a. Draw the circuit diagram for the above circuit. **(10 marks)**

b. Using the Boolean Algebra Identities (located at the end of the paper) check if this above expression is an optimal expression. **(15 marks)**

c. Prove that your new solution function the same as the old function using truth tables. **(10 marks)**

d. How many bytes are in this sentence? **(5 marks)**

e. Differentiate between parallel and serial data transfer. In relation to parallel data transfer what is jitter? What is the typical cause of jitter? **(10 marks)**