

National College of Ireland

BSc (Hons) in Computing – Full-time – Year 1 – BSHC 1
BSc (Hons) in Business Information Systems – Full-time – Year 1 – BSHBIS 1
BA in Management of Technology in Business – Full-time – Year 1 – BAMTB 1
Higher Certificate in Computing Applications & Support – Full-time – Year 1 – HCC 1
BSc (Hons) in Computing – Part-time – Year 1 – BSHCE 1
BSc (Hons) in Business Information Systems – Part-time – Year 1 – BSHBIS 1
Higher Certificate in Computing Applications & Support – Part-time – Year 1 – HCCE 1

Semester Two Examinations – 2014/15

**Friday 8th May 2015
10.00am – 11.30am**

Computer Architecture

Dr Rob Brennan
Dr Jennifer McManis
Dr Hugh O Donnell
Dr Keith Maycock

Answer **all** questions in Section A and either **all** questions in sections B **or** C

Duration of exam: 90 minutes

Attachments: N / A

Section A

1. Convert the following base two numbers into Hexadecimal numbers:
 - 10
 - 11001
 - 01010
 - 011111

[10 Marks]
2. John Mauchley and J. Presper Eckert developed an electronic computer called ENIAC. Describe the ENIAC machine.

[10 Marks]
3. Discuss the technical advancement that sparked the first three generations of Computer Architecture.

[15 Marks]
4. Draw a Finite State Machine for each of the following language:

[10 marks]

$L = \{001, 1100, 00101\}$
5. How much memory does it take to store the following statement?

[5 marks]

I Love Computer Architecture

Section B

1. Differentiate between Serial and Parallel data transfer strategies, discussing the advantages and disadvantages of each data transfer strategy. Give an example of where you would find such strategies being implemented.

[15 marks]
2. Describe three internal CPU characteristics that affect performance.

[15 marks]
3. Describe the steps that the control unit carries out in a typical CPU in executing a program. What is this process known as?

[10 marks]
4. Differentiate between any two cooling systems that you have studied.

[10 marks]

Section C

Congratulations, the National College of Ireland have decided to start building digital components to enhance their location aware services. The new device can be described using the following functional expression:

$$F = \overline{A+B}(AD + CD) + C + \overline{C}B$$

- a. Draw out the logic diagram for the expression. **[10 Marks]**
- b. Using the laws of Boolean algebra reduce the expression to its simplest form. **[20 Marks]**
- c. Prove that the reduced expression is equivalent to the original expression using truth tables, i.e. you should complete a truth table for the first expression and a second truth table for the reduced expression and compare the results. **[15 Marks]**
- d. How much money can you save Intel if they manufacture 100,000 circuits of your reduced design, if each logic component costs 1 euro? **[5 Marks]**