

National College of Ireland

BSc (Hons) in Computing – Full Time - Year 1 – BSHC1
BSc (Hons) in Business Information Systems – Full Time - Year 1 – BSHBIS1
Higher Certificate in Computing – Full Time - Year 1 – HCC1
BA (Ord) in Management of Technology in Business – Full Time - Year 1 – BAMTB1
BSc (Hons) in Computing – Part Time - Year 1 – BSHCE1
BSc (Hons) in Business Information Systems – Part Time - Year 1 – BSHBIS1
Higher Certificate in Computing – Part Time - Year 1 - HCCE1

Semester Two Examinations – 2013/2014

Tuesday 20th May 2014
6.30pm – 8.00pm

Computer Architecture

Dr. Rob Brennan
Dr. Thomas Newe
Mr. Ciaran O’Leary
Dr. Keith Maycock
Mr. Frank Slyne
Mr. Paul Kearney
Mr. Eamon Nolan
Mr. David Tracey

Answer question one and **one** other question

Duration of exam: 90 minutes

Attachments: Boolean Algebra Identities

Question One

- a) Discuss the Entscheidungsproblem and the significance that this had on the Computer Architecture.
- b) Who invented Turing Machines? Describe the function of Turing machines.
- c) Create a Finite State Machine to recognise all the words in the following language: $L=\{a, aab, abab, abb\}$.
- d) Draw a labeled diagram of the famous Von Neumann machine.
- e) Convert the following Octal numbers, 23, 14 into their equivalent Binary representation. You must show how the method that you use for the conversion.
- f) Convert the following Hexadecimal numbers, A12, BBC into their equivalent Octal numbers. You must show how the method that you use for the conversion.
- g) How many bytes does it take when the following: I love Computer Architecture, is saved as .txt?
- h) Differentiate between asymmetric and symmetric cryptosystems.
- i) Create an eight bit representation of -17.
- j) Using truth tables, prove De Morgan's first law.

(10 * 5 marks)

Question Two

- a) Identify and describe the advantages of ensuring that a digital component is optimal? **(10 marks)**
- b) Congratulations, you have just been shortlisted for a position with Intel. Using your specialized skills you have hacked into one of the Intel servers and found an expression that represents the schematic of a new logic chip. If all the logic components cost the same amount can you make the component cheaper?
The component is described as follows:

$$F = AB(CD + \overline{AB} + \overline{AD}) + AD(C + \overline{D})$$

- I. Draw a logic diagram that represents the digital component. **(10 marks)**
- II. Using Boolean algebra ensure that the component is an optimal component. **(10 marks)**
- III. Using truth tables show that the new functional expression operates the same as the expression above. **(10 marks)**
- IV. How much money can you save Intel if they go with your new design? **(10 marks)**

Question Three

- a) Cloud Computing has had great marketing drive over the past seven years. Discuss the role that you think Cloud Computing will have when considering the Internet of Things. **(20 marks)**
- b) Discuss the internal CPU characteristics affecting performance. **(10 marks)**
- c) Differentiate between two different cooling system approaches. **(20 marks)**