National College of Ireland

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

**Semester Two Examinations – 2012/13**

**Saturday May 18th 2013**
**10:00am – 11:30am**

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## Computer Architecture

Prof. Seamus Lawless
Mr. Ciaran O' Leary
Dr. Thomas Newe
Dr Keith Maycock

Answer any **two** questions

**Duration of exam:** 90 minutes
**Attachments:** Boolean Algebra Identities

## Question 1

a) John Von Neumann is highly regarded as one of the leaders of Computer Science, and his machine the IAS machine is architecturally similar to modern computers. Draw the schematic of the Von Neumann machine. **(10 marks)**

b) Describe the significance of the Internet2 project? What are the major changes in networking that are being introduced due to this change? **(10 marks)**

c) Discuss the significance of the Turing Machine. **(4 marks)**

d) Draw a Finite State Machine that is capable of recognizing the following alphabet: L={AB, BBA, B, ABABAB}. **(10 marks)**

e) Using Truth tables, prove De Morgans two laws found in the Appendix. **(16 marks)**



## Question 2

a) Convert the following base two numbers into a corresponding Octal representation: 101, 1101, 10 **(15 marks)**

b) Express the following negative numbers as an eight bit binary representation: -24, -51 **(10 marks)**

c) Describe the system clock attributes in detail. **(10 marks)**

d) Describe the POST test in detail and in particular how this test can be used to diagnoise and identify problems within a machine. **(15 marks)**

## Question 3

a) The PDP-8 machine had a major invention. Describe this major invention using a diagram to support your answer. **(10 marks)**

b) The fourth generation of Computers sparked the beginning of the PC explosion. Discuss the major innovation that caused this generation leap and the corresponding industry interactions that caused the start of the PC industry. **(10 marks)**

c) The following expression represents the digital schematic of a new component being developed by NCI to monitor the neuro activity of stuents in a traditional classroom environment:

$$F = A(ABC + \overline{AB}) + C(DB+\overline{A})$$

i. Draw the full schematic **(10 marks)**

ii. Using the Boolean Algebra identities reduce the function to its simplest expression. **(10 marks)**

iii. Prove that your new design is functions the same as the original circuit using truth tables. **(10 marks)**