National College of Ireland

BSc in Computing, year 1 BSHC1
BSc in Computing – Evening, year 1 BSHCE 1
BSc (Hons) in Business Information Systems, year 1 BSHBIS1
BSc (Hons) in Business Information Systems – Evening, year 1 BSHBISE1
Higher Certificate in Science in Computing Applications and Support, year 1 HCC1
Higher Certificate in Science in Computing Applications and Support – Evening, year 1 HCC1

Semester Two Examinations – 2009/2010

Friday 30th April, 2010
2.00pm – 3.30pm

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Computer Architecture

Dr. Brian Nolan
Ms. Elizabeth Sherry
Mr. Keith Maycock

Answer any **two** questions

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

Question one

a How many nibbles does it take to represent AA base 16 in Binary? **(5 marks)**

b Convert 17 base 8 into a binary number. You must show the process of converting the number. **(5 marks)**

c Compare and contrast the advantages of using an assembly programming language in comparison to using an Object Oriented programming language. **(5 marks)**

d Congratulations you have won first prize in designing a suitable logic circuit to create an on-demand cloud computing component for mobile phones. Intel is going into production and is going to produce one million components. Before production you need to make sure that the circuit is optimal. If all logic chips and inverters cost one euro, how much money can you save Intel? **(20 marks)**

The function is described as:

$$F = AD(\bar{D} + AC) + C(\overline{A+C} + C)$$

e Prove that your solution is optimal by using truth tables. **(15 marks)**

Question two

a Discuss the precautions that you should take when working inside a typical computer. Detail what could happen if these precautions are not followed. **(5 marks)**

b Define the computer term BIOS. What function does the system BIOS have in a typical computer system? **(5 marks)**

c Discuss the POST program that typical BIOS would run after the computer has been turned on. **(10 marks)**

d Write an assembly program that produces the output seen on the following page. Your solution should be produced using loops to determine the number of stars on each line. **(25 marks)**
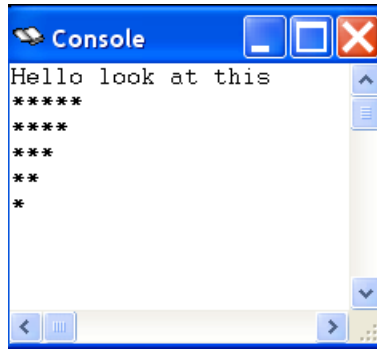
e   Convert 10 base 2 into a decimal number. Note: you must show the method you used for the conversion.   **(5 marks)**

Question three

a   Discuss the protocol you would use when converting from decimal to hexadecimal.

                                                                                                                    (5 marks)

b   What are Turing machines used for? What is the relationship between Turing machines and Finite State Machines?   **(5 marks)**

c   Construct a Finite State Machine to accept the following words, L ={a, aab, abab, abb}.
                                                                                                                    (5 marks)

d   Write an assembly program to print out the factorial (factorial 3 = 3*2*1 = 6) of a user entered number   **(20 marks)**

e   Differentiate between parallel and serial data transfer.   **(5 marks)**

f   Explain two different types of cooling systems used to keep a CPU at a reasonable temperature.   **(10 marks)**

Basic Identities of Boolean Algebra:

1. $X + 0 = X$

2. $X.1 = X$

3. $X + 1 = 1$

4. $X.0 = 0$

5. $X + \overline{X} = X$

6. $X.\overline{X} = X$

7. $\overline{\overline{X}} = X$

Commutative

8. $X + Y = Y + X$

9. $XY = YX$

Associative

10. $X + (Y + Z) = (X + Y) + Z$

11. $X(YZ) = (XY)Z$

Distributive

12. $X(Y + Z) = XY + XZ$

13. $X + YZ = (X + Y)(X + Z)$

DeMorgan's

14. $\overline{X + Y} = \overline{X}.\overline{Y}$

15. $\overline{X}.\overline{Y} = \overline{X + Y}$