

DUBLIN INSTITUTE OF TECHNOLOGY
KEVIN STREET, DUBLIN 8

Diploma in Computer Science

Year 1

Summer Examination 2001

Algorithms, Data Structures and Computer Technology

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Monday 14th May 2001
2:30 – 5:30

Attempt
2 questions from *Section A*
and
2 questions from *Section B*

All questions carry equal marks.

Section A

1. (a) Explain what is meant by the *base* of a number system. What is the name commonly given to the number system that has a base of
- (i) 2
 - (ii) 8
 - (iii) 10
 - (iv) 16
- (3 marks)**
- (b) Convert the following binary numbers to *decimal* and *hexadecimal*.
- (i) 110101101010
 - (ii) 1000111
- (4 marks)**
- (c) Convert the following decimal numbers to *octal*.
- (i) 197
 - (ii) 44
- (4 marks)**
- (d) Solve the following binary operations
- (i) $101010111 + 101001$
 - (ii) $110101011 - 010010$
 - (iii) $1010 * 110$
- (6 marks)**
- (e) List three methods for representing negative binary numbers. Discuss the problems with each. Represent the decimal number -130 using each of the methods outlined.
- (8 marks)**
2. (a) Discuss in full how a real number is represented using *fixed point notation* and *floating point notation*. Contrast the two methods, explaining in detail why one is superior to the other. What factors effect precision and range in *floating point notation*?
- (8 marks)**
- (b) Explain *Binary Coded Decimals (BCD)*. Why might it be preferred over standard decimal notation? Represent the number 452 in BCD.
- (5 marks)**

- (c) Give the logic symbol and truth table for each of the following type of gate.
- (i) AND
 - (ii) OR
 - (iii) NAND
 - (iv) NOR

(2 marks)

- (d) Produce a truth table for each of the expressions below. Then reduce each expression **using the theorems of boolean algebra**, explaining each step along the way.

(i) $\overline{(X + Y)} (X + Y)$

(ii) $P(P + Q)$

(10 marks)

3. (a) What is a flip flop?
Explain, using diagrams the operation of the SR flip flop. You should document in your answer how a flip flop can be set to store a 0 or a 1, and how these values remain within the flip flop despite certain changes on the input lines.

(10 marks)

- (b) Explain in full what is meant by the “*memory hierarchy*”?

(6 marks)

- (c) Explain the terms *opcode*, *operand*. Identify clearly the function of each of the opcodes in the 68000 assembly language code below. What does this program do?

```
MOVE A, D0
CMP DO, B
BHI OVER
MOVE B, D0
OVER
```

(9 marks)