*Ollscoil na hÉireann, Gaillimh*
*National University of Ireland, Galway*

GX 1500

# Semester II Examinations, 2003/2004

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|---|---|
| Exam Code(s) | 1IF1, 1BO1 |
| Exam(s) | First Year Information Technology<br>First Year Biomechanical Science |
| Module Code(s) | CT101 |
| Module(s) | Computing Systems |
| Paper No. | 1 |
| Repeat Paper | |
| External Examiner(s) | Professor Paddy Nixon |
| Internal Examiner(s) | Professor G. Lyons<br>Dr. Aaron Golden<br>Mr. P. Bigioi |

**Instructions:** Answer any 4 questions.
Use a separate answer book for each section.
All questions will be marked equally.

| | |
|---|---|
| Duration | 3 hrs |
| No. of Answer Books | 2 |
| No. of Pages | 4 |
| Department(s) | Information Technology |

## Section A (Questions 1 to 3)

### Question 1

**a)** Outline the main tasks of an operating system, illustrating each task with an appropriate example.

8 MARKS

**b)** How does an operating system ensure that numerous active 'processes' can access the one processing unit inside a computer?

8 MARKS

**c)** Outline the importance of HCI in computer software design, illustrating your answer with appropriate examples.

9 MARKS

### Question 2

**a)** What is meant by a 'mark up language' and why were these developed? What have HTML and Latex got in common, and in what way are they different?

8 MARKS

**b)** Why is there a need for encryption in modern computer systems? Outline specific approaches to the design of encryption algorithms, illustrating your answer with appropriate examples.

8 MARKS

**c)** Similarly, why is there a need for data compression in modern computer systems? Outline specific approaches to the design of compression algorithms, illustrating your answer with appropriate examples.

9 MARKS

### Question 3

**a)** What is meant by a 'software virus'. What is the typical life cycle of such a software virus, and how do these spread?

12 MARKS

**b)** The operating systems produced by Microsoft run on in excess of 90% of the world's personal computers - and never a day goes by without the detection of yet another Microsoft targeted virus. Can you explain why this is the case, from a technical point of view?

13 MARKS

## Section B (Questions 4 to 6)

### Question 4

**a)** Describe both XOR and XNOR logic gates, in terms of symbols and truth tables.

7 MARKS

**b)** Consider the following three input variable function: f(X2,X1,X0) = X2'X1'X0' + X2'X1X0' + X2X1X0 + X2X1'X0. Determine the minimum form of the function using Karanugh maps. Implement the function using both basic logic gates and ROM.

10 MARKS

**c)** Consider the following 32 bit number, represented in IEEE745 floating point standard: 01000000111100000000000000000000. What is the decimal number it represents?

8 MARKS

### Question 5

**a)** Convert the binary number 11001010011111 to hexadecimal form. Convert the same number to its decimal form. Compare results by performing the conversion from hexadecimal to decimal.

7 MARKS

**b)** Convert the fractional decimal number 0.32323 to base its binary representation (base 2). Use maximum 16 bits precision.

8 MARKS

**c)** Represent the positive number 248 in binary. What is its representation in two's complement, using 10 bits? Represent the negative number -248 in two's complement using 10 bits.

10 MARKS

### Question 6

**a)** Describe the main types of memory. How many address lines and data lines would have a 1024 X 8 memory chip?

7 MARKS

**b)** Describe (draw) the basic computer organization, describe the operation and role of each of the subsystems (buses, central processing unit, memory and I/O subsystems).

10 MARKS

**c)** Describe the fetch-decode-execute cycle. Given a processor with the architecture in the Figure 1, please describe the content of the main registers during the fetch-decode-execute cycle of instruction ADD AX,#5, located in the main memory at address 0x1004.

8 MARKS

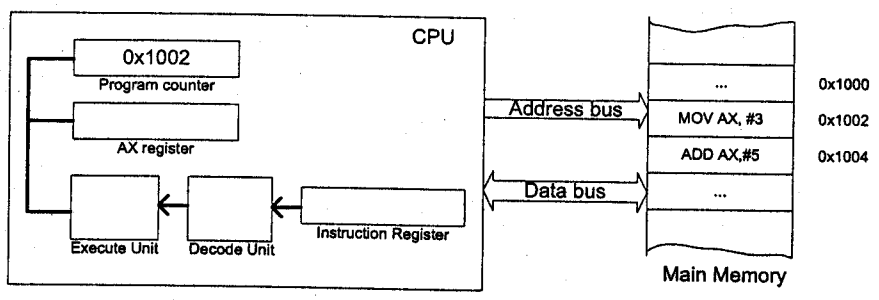


**Figure 1: Fetch-Execute-Decode**