

**UNIVERSITY OF LONDON**

**GOLDSMITHS COLLEGE**

**B. Sc. Examination 2002**

**COMPUTING AND INFORMATION SYSTEMS**

**IS51006A (CIS106) Introduction to Computing**

**Duration: 3 hours**

**Date and time:**

---

*This paper is in two parts, Part A and Part B. There are a total of three questions in each part. You should answer two questions from Part A and two questions from Part B. Your answers to Part A and Part B should be written in separate answer books.*

*Full marks will be awarded for complete answers to a total of four questions, two from Part A and two from Part B. Each question carries 25 marks. The marks for each part of a questions are indicated at the end of the part in [.] brackets.*

*There are 100 marks available on this paper.*

*Electronic calculators must not be programmed prior to the examination. Calculators which display graphics, text or algebraic equations are not allowed.*

**Part A: answer TWO questions from this Part**

**Question 1**

- (a) Produce a Turing Machine program that changes a (possibly infinitely long) sequence of digits (1s or 0s) to a sequence of Xs (where X is the capital letter X), except that the last digit will be changed to Y. For example, the program will transform the tape

b	1	0	1	0	b
---	---	---	---	---	---

into:

b	X	X	X	Y	b
---	---	---	---	---	---

You can assume that the read-write head is initially located over the left-most cell (which is blank, represented by the symbol *b*) and will be over the right-most cell in the halt state.

Provide a step-by-step illustration of how your program works. [12]

- (b) The following bit pattern represents a single precision floating point number with an 8 bit exponent (with a bias of 127) and a normalised 23 bit significand conforming to IEEE 754.

Sign	Exponent	Significand
0	1000 0010	1100 0000 0000 0000 0000 000

Showing all your working, calculate which number this represents in base 10.

[8]

- (c) Distinguish between ‘compilers’ and ‘interpreters’. [5]

**Question 2**

- (a) Explain how information is stored in and read from Main Memory. [6]
- (b) (i) What is ‘random access’? [3]  
(ii) Are Compact Discs random access devices? Explain your answer. [5]
- (c) Explain the format of instructions for a Central Processing Unit (CPU). Give two instructions as examples and explain their meanings. [5]
- (d) (i) Draw a diagram to illustrate the connection between the Central Processing Unit, the Main Memory, and the Input/Output Devices. [3]  
(ii) How many busses are there in a modern computer, and what are they? [3]

### Question 3

- (a) What is the difference between a *uni-programming* and a *multi-programming* operating system? [2]
- (b) (i) What is the use of 'clocks' in computer hardware? [2]  
(ii) What is the relationship between clock frequency and the CPU's processing speed? Explain your answer. [3]
- (c) Explain the concept of 'Interrupt Driven I/O'. [5]
- (d) What is 'swapping'? Why it is useful? [6]
- (e) What is 'pipelining'? Describe its advantages and disadvantages. [7]