OLLSCOIL NA hÉIREANN, CORCAIGH THE NATIONAL UNIVERSITY OF IRELAND, CORK

COLÁISTE NA hOLLSCOILE, CORCAIGH UNIVERSITY COLLEGE, CORK

AUTUMN EXAMINATION 2002

First Year Computer Science

CS1020: Computer Systems 1

Professor J.G. Hughes Professor C.J. Sreenan Dr. Barry O'Sullivan

Instructions

Answer all questions.

All questions carry equal marks. This examination is worth 210 marks. Coursework submitted during term is worth 90 marks.

Calculators may be used. Please indicate the make and model of your calculator at the start of your exam script.

Duration

3 Hours

- 1. a) Explain any 3 of the following, making use of suitable examples:
 - i. Describe briefly the characteristic features of a multi-user/multitasking operating system.
 - ii. Explain the following terms:
 - A. File
 - B. Path
 - C. Command Prompt
 - D. Shell
 - iii. Show how an anchor element in HTML can be specified to refer to the FTP protocol. How can a link be specified that when activiated, by the user clicking on it, starts an email session for the user's mailer?
 - iv. In the context of web-page development, what are the differences between logical document structure and physical layout? How does the web designer specify how a page should be structured and how it should be rendered?

(10 marks)

- b) In the laboratory sessions for this course students were asked to develop simple web-pages as exercises on particular facets of web-page development. Please develop a simple web-page for each of the following, incorporating a style-sheet into the head of the page where necessary. In each case ensure that the document is well structured and includes a properly defined head, title and body. Use your own names for images and web-sites where they have not been specified.
 - i. Develop a simple web-page that has in its body a single image (assume it is called logo.gif and is located in the current directory). The image should be centered on the page. The background of this page should be white.
 - ii. Develop another simple web-page which has as its body a main-heading, followed by a short paragraph. The text of the heading should be specified so that it would appear in red, while the paragraph text would appear in blue.Explain alternative ways of specifying the stylistic aspects of this exercise.
 - iii. Develop a third simple web-page which contains a table in its body. The table should have 2 rows and 2 columns. Each cell in the first row should contain a person's first name which is
 - hyperlinked in a manner which would have the functionality of sending an email to the named person. The cells in the second row of the table should contain images of the people named in the first row. The images should be linked to homepages of the named people.

(22 marks)

c) Explain the effects of the following UNIX commands. Note that <return> means pressing the Return or Enter key on on the keyboard; file1 and file2 are files; www is a directory;

i. mkdir www <return>
ii. cd /var/ <return>
iii. cp ../file1 ../../file2 <return>
iv. mv file1 ../www <return>
v. chmod ug=r file1 <return>

(10 marks)

2. a) Explain any 3 of the following, making use of suitable examples:

- i. How many bits are required to represent a hexadecimal digit? How many are required for an octal digit? Why?
- ii. How does *Binary Coded Decimal* representation of a decimal number differ from its true binary representation?
- iii. Describe a procedure for converting from one's complement to signed magnitude.
- iv. What is difference between a CD, a CD-R and a CD-RW?
- b) Answer all of the following:
 - i. Convert the following numbers to binary using both the *successive halving method* and the *powers of two method*:
 - 29
 - 9
 - ii. Convert the both of the above numbers into octal and hexadecimal.
 - iii. Convert the following numbers into 8-bit *signed-magnitude*, *one's complement*, *two's complement* and *excess notation*:
 - -45
 - -16
 - iv. What is the largest number that can be represented in each of the following:
 - A. 8-bit signed magnitude;
 - B. 8-bit one's complement;
 - C. 8-bit two's complement;
 - D. 8-bit excess notation;

(22 marks)

(10 marks)

c) Most I/O devices use the ASCII character code, although UNICODE is rapidly gaining acceptance as the computer industry goes global. What are the differences between ASCII and UNICODE?

(10 marks)

- 3. a) Explain any 3 of the following, making use of suitable examples:
 - i. What is meant by bus arbitration?
 - ii. What is meant by the terms *positive logic* and *negative logic*. What are the ramifications of switching between them?
 - iii. Illustrate, with the aid of a diagram, how a *Full Adder* for 1-bit addition works. What is it's truth table?
 - iv. Describe the relationships between a bit, a byte and a register?

(10 marks)

b) Consider the following truth-table – having 3-inputs (A,B,C) and 1-output (X):

А	В	С	Х
0	0	0	0
0	0	1	0
0	1	0	0
0	1	1	1
1	0	0	0
1	0	1	1
1	1	0	1
1	1	1	1

- i. Derive a Sum-of-Products expression for the output in the truth-table;
- ii. Draw a logic circuit of the Sum-of-Products expression you have derived.
- iii. Why is this logic function called the *majority function*?

(22 marks)

c) An eight-input multiplexer circuit is illustrated in Figure 1. Explain how the circuit works. What would a multiplexer be used for in the real-world? (10 marks)



Figure 1: An Eight-Input Multiplexer Circuit

- 4. a) Explain any 3 of the following, making use of suitable examples:
 - i. What is an *addressing mode*? Give examples of a number of modes and distinguish between their usages.
 - ii. In the IEEE 754 Floating Point standard, what are the differences between *normalised* and *denormalised* numbers?
 - iii. What is the purpose of the Instruction Set Architecture Level of a modern computer?
 - iv. Give examples of the typical data-types defined at the ISA level of a computer.

(10 marks)

- b) i. Convert the following decimal numbers into IEEE 754 format single precision numbers. Give your answer in hexadecimal.
 - 1.25
 - -4.125
 - ii. Convert the following IEEE 754 format single precision numbers into decimal.
 - 3F000000
 - 3F800000
 - 3FC00000

(22 marks)

c) Floating point numbers can be used to model the real-number system of mathematics, although there are some important differences. Explain how *zero* and *infinity* are represented. Does this scheme handle division by zero robustly – i.e. does dividing by zero always result in infinity? (10 marks)

- a) The operating system is characterised by the notions of *virtual memory*, *file I/O* and *process management*. Briefly explain what is meant by each of the phrases marked in italics in the previous sentence. (10.5 marks)
 - b) Why does an operating system interpret only some of the Operating System Level commands, but the microprogram interprets all of the ISA level instructions? (10.5 marks)
 - c) In the context of assembly languages:
 - i. What is the difference between the *instruction counter* and the *program counter*? After all, they both keep track of the next instruction in a program.
 - ii. What is a macro? What is a pseudo-instruction? What are the differences?

(10.5 marks)

- d) In the context of the assembly process:
 - i. What is a *symbol table*? There are a number of ways of organising this table. Briefly discuss some of these approaches.
 - ii. Explain the differences between macro expansion and linking and loading.

(10.5 marks)