THE AUSTRALIAN NATIONAL UNIVERSITY

Mid-semester Exam

Semester 1 - 2004

COMP1200

(Perspectives on Computing)

Writing Period: 1 hour duration

Study Period: 0 minutes duration

Permitted Materials: None

Maximum Marks: 40

Answer ALL questions

Family Name :

Given Names :

Student Number :

Answer all questions in the space provided in either black or blue pen. This exam is worth 20% of the class mark and will be marked out of 40. Marks for individual questions are given in square brackets. Students are allowed 60 minutes to complete the exam. Students are permitted to have pens, pencil, ruler, etc. However, no other materials are permitted. If there is insufficient space for you to answer a question then use the blank pages at the end of this exam paper. Clearly indicate this in the space provided for the answer.

No copy of this paper is to be removed from the examination room by candidates nor may any portion of the paper be copied. All copies must be returned to the examiner.

The following are for use by the examiners

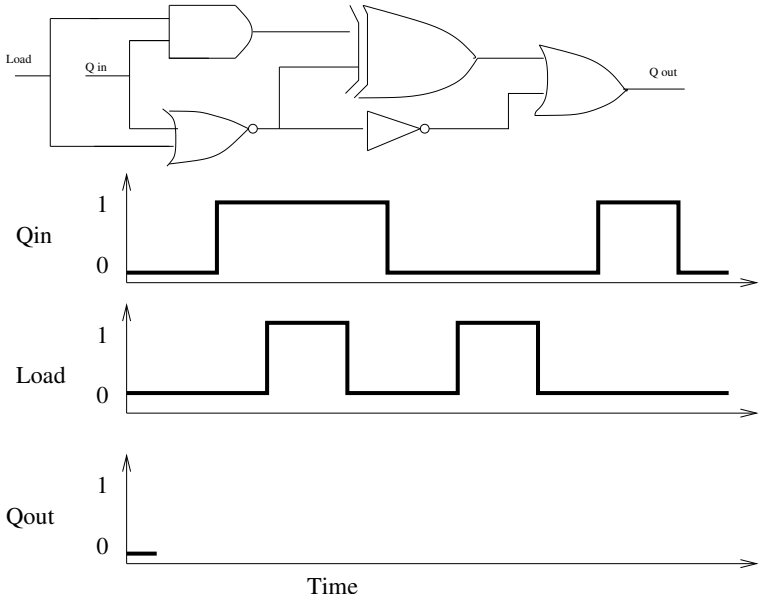
Q1	Q2	Q3	Q4	Q5	Q6	Q7	
Q8	Q9	Q10	Q11	Q12	Q13	Q14	Total Mark

Computer Architecture

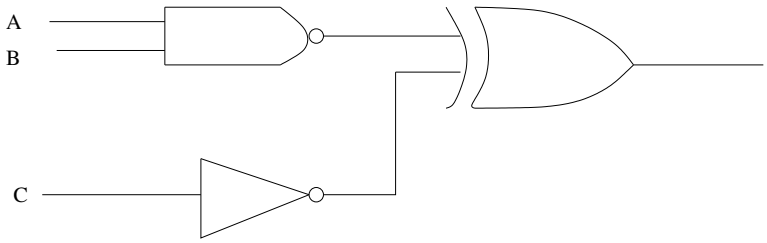
1. [5] Fill in the blanks in the following sentences.

- An instruction set that contains 24 instructions would require at least _____ bits to represent these instructions.
- A computer with 512MB of memory would contain _____ bits of memory.
- The bit pattern 110011010 in 9-bit twos-complement represents the value _____(in decimal). Whereas the value -35 (in decimal) is represented as the bit pattern _____ in 9-bit twos-complement representation.
- Usually the instructions in an assembly language are divided into two parts. Given an instruction `(Add` R_1`,` R_2`, 8)` which adds the content of register R_2 and the value 8 and puts the result into register R_1, `Add` is the _____ part, and R_2 and the value 8 are the _____ part.
- In the design of CPU, what does ALU stand for _____?

2. [3] Timing diagrams can be used to show how logic circuits work over time. Basically, graphs are drawn for each of the inputs and outputs of a circuit. The y-axis of the graph shows if the input (or output) is 0 or 1. The x-axis shows the progression of time. Given the following circuit diagram for a one bit register, complete the below timing diagram for the Q_{out} output.



3. [3] Complete the truth table for the below circuit diagram.



A	B	C	RES
0	0	0	
0	0	1	
0	1	0	
0	1	1	
1	0	0	
1	0	1	
1	1	0	
1	1	1	

4. [2] Two opposite approaches have been used to improve the performance of computing systems. One is the CISC machine and another is the RISC machine. Here CISC stands for _____ and RISC stands for _____. For each of these machines state at least one advantage and one disadvantage.

Operating Systems and Networks

5. [2] Fill in the blanks in the following sentences.

- The basic unit of an OS manipulated is _____, and PCB stands for _____.
- Ethernet usually adopts two types of topologies _____ and _____.

6. [2] In an operating system, what is meant by time-multiplexing and space-multiplexing of running programs? Use an example to illustrate the concepts.

7. [3] In memory management, logical and physical addresses concepts are introduced. Why use different addresses in the same computer system? Illustrate your explanation with an example.

8. [4] In file system management, what is the basic allocation unit in managing hard disk storage space? There are two different ways in which a file can be stored onto a hard disk. Can you explain these two approaches?

9. [3] In an OS, the processes can be in one of the following states: _____, _____, _____, _____, and _____. Explain in which cases a process is terminated.

Computation

10. [4] Fill the blanks in the following sentences.

- A 24-bit color frame contains 480×580 pixels. How many KBs of memory is required to store the frame?
- FIG and JPG are examples of the _____ and _____ graphics approaches to representing images.
- In the following listed languages, _____ is the functional language, _____ is the procedural language, _____ is the object-oriented language, and _____ is the logic language.

  `Ada, Prolog, Java, Lisp`.

- In general, an algorithm that has a running time of $O(n\sqrt{\log n})$ runs (faster/slower) _____ than another algorithm with a running time of $O(n \log^2 n)$.

11. [4] What is the basic manipulation unit in a compiler? What are the three main stages in the compilation process? Given a conditional statement, **if** $y = 4$ **then** $x := x - 5$ **end**, provide the output of this statement after it has passed through the first stage of the compilation.

12. [3] The input of a compiler is called _____ and its output is called _____. The output of `Eiffel` compiler _____ is a higher-level language, while the output of the `Java` compiler is _____ which is a language independent of any machine. Then, this language code is _____ into machine code to enable it to be executed on a machine.

13. [2] What is the definition of a tractable problem? In the following we list the computational complexities of four problems. Point out which problems are tractable and which problems are intractable.

- Problem A: $O(n \log n)$
- Problem B: $O(2^{\sqrt{n}})$
- Problem C: $O(n^{3/2} \log \log n)$
- Problem D: $O(10^{0.7 \log \log n} n^2)$

This page is for rough work.