UNIVERSITI SAINS MALAYSIA

First Semester Examination
Academic Session 2001/2002

September 2001

CSI501 – Computer Organisation

Duration : 3 hours

INSTRUCTION TO CANDIDATE:

- Please ensure that this examination paper contains **FOUR** questions in **THREE** printed pages before you start the examination.
- Answer **ALL** questions.
- You can choose to answer either in Bahasa Malaysia or English.

ENGLISH VERSION OF THE QUESTION PAPER

1. (a) What are the main differences between 1's complement and 2's complement?

(5/100)

(b) When adding binary numbers using 2's complementary form, how can we determine the correctness of the result?

(5/100)

(c) Convert 13023031_4 directly into hexadecimal (without using any base as intermediary). Explain your method.

(5/100)

(d) Assume we're using SEEMMMMM floating point format, whereby S is the sign digit (0 for positive and 9 for negative), EE represents exponent in "excess 40" format, and decimal point is at left of the first mantissa digit.

(i) What is the **smallest** decimal number(s) that can be represented using this method before underflow occurs? What is the equivalent floating-point representation for this smallest decimal number?

(ii) What is the **largest** decimal number(s) that can be represented using this method before overflow occurs? What is the equivalent floating-point representation for this largest decimal number?

(10/100)

2. (a) For the circuit depicted in Figure 1:

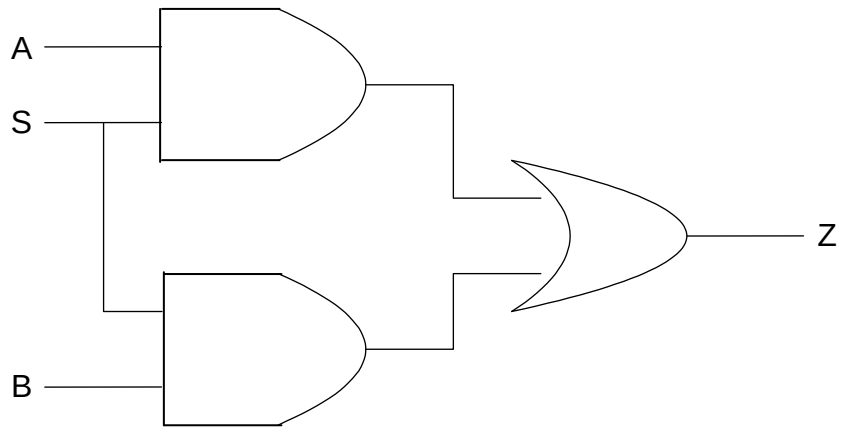

Figure 1

(i) State its Boolean function.

(ii) What are the values of A, S and B that will result in Z = 1?

(10/100)

(b) Assume the instruction word of a CPU is made up of 8-bit opcode and 32-bit address field. How many different instructions can this CPU use? How much memory can this CPU address?

(5/100)

(c) Show how relative addressing and base-offset addressing modes work.

(5/100)

(d) Briefly describe the main differences between 'lossless' and 'lossy' data compression techniques. For each technique, indicate which data format is more suitable for compression.

(5/100)

3. (a) State **two (2)** shortcomings of Programmed I/O technique and show how they can be overcome using interrupts.

(5/100)

(b) Describe the steps that occur when a system receives multiple interrupts.

(5/100)

(c) Suppose there were no interrupts provided in a computer. What capabilities would be lost?

(5/100)

(d) What happens when cache 'hit' and cache 'miss' occur? How does it affect the performance of the computer in each case?

(10/100)

4. (a) What are the differences between serial and parallel buses? Provide an example of each bus.

(5/100)

(b) Why is it easy and fast to perform seek, read and write on a disk but not on a tape?

(5/100)

(c) Reduced instruction set computers (RISC) provide a large number of general-purpose registers and very few memory access instructions. Most instructions use registers instead of memory. What are the advantages of such an architecture?

(5/100)

(d) Many methods exist to optimise and enhance system performance and reduce bottlenecks. Briefly describe any **three (3)** of these methods.

(10/100)