UNIVERSITI SAINS MALAYSIA

Stamford College

First Semester Examination
2004/2005 Academic Session
October 2004

External Degree Programme
Bachelor of Computer Science (Hons.)

CST101 – Computer Organization

Duration : 2 hours

INSTRUCTIONS TO CANDIDATE:

- Please ensure that this examination paper contains **FOUR** questions in **FOUR** printed pages before you start the examination.
- Answer **ALL** questions.
- On each page, write *only your **Index Number***.

1. (a) State the most obvious difference between first generation and second generation computers.

(4/100)

(b) Convert the following numbers to the radix shown against them (show your steps used to obtain the answers):

(i) $(253.523)_{10}$ to hexadecimal

(ii) $(101010.101)_2$ to decimal

(iii) $(45.75)_{10}$ to binary

(6/100)

(c) (i) Write -85_{10} in binary sign-magnitude, 1s complement and 2s complement forms (use 8 bits).

(ii) Perform the following operation in unsigned decimal number system by using the complement method:

$$(725)_{10} - (1956)_{10}$$

(8/100)

(d) Write the following number in single precision IEEE Floating point format. (Use suitable rounding technique.)

$$(-158.7125)_{10}$$

(6/100)

2. (a) Design a combinational circuit for a 3-bit full subtractor. You should:

(i) Write the truth table for the above combinational circuit.

(ii) Find the Boolean functions for the 3-bit full subtractor from the above truth table.

(iii) Find the simplified form of the expression using Karnaugh map.

(iv) Draw the combinational circuit for the above using exclusive-OR gate, AND gate and OR gate only.

(12/100)

(b) (i) What is the function of flip-flops?

(ii) Explain the differences between combinational and sequential circuits.

(6/100)

(c) A sequential circuit has 2 D flip-flops A and B. They have two inputs x and y and one output z.

The equations of the flip-flop inputs and the circuit output are given below:

$$D_A = x'y + xA$$
$$D_B = x'B + xA$$
$$z = B$$

(i) Draw the logic diagram of the above circuit.

(ii) Construct the state table.

(10/100)

3. (a) Explain the following components:

(i) MBR

(ii) MAR

(6/100)

(b) Write programs to evaluate the following arithmetic statement using 0-address, 1-address and 2-address instructions:

$$X = A*[B*C - D]/F*(G+H)$$

(12/100)

(c) What is the difference between the following pairs of addressing modes? Give examples and explain.

(i) Immediate addressing mode and absolute addressing mode.

(ii) Register addressing mode and indirect register addressing mode.

(6/100)

4. (a) Explain the following terms:

(i) SRAM

(ii) Write through policy

(iii) ROM

(6/100)

(b) A cache memory of size 16K words has memory blocks of size 16 words. The main memory has a size of 32M words.

(i) Find the main memory address using direct mapping, associative mapping and 2-way set associative mapping techniques.

(ii) How many blocks are there in the main memory?

(iii) How many sets are there in the cache memory?

(10/100)

(c) List **two (2)** characteristics of RISC and CISC architecture. Give examples of computers that are built based on RISC and CISC architecture.

(8/100)

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