

UNIVERSITI SAINS MALAYSIA

First Semester Examination
Academic Session 2000/2001

September/October 2000

CSI501 - Computer Organisation

Duration : [3 hours]

INSTRUCTION TO CANDIDATE:

- Please ensure that this examination paper contains **FIVE** questions in **FOUR** printed pages before you start the examination.
 - Answer **ALL** questions.
 - You can choose to answer either in Bahasa Malaysia or English.
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ENGLISH VERSION OF THE QUESTION PAPER

1. (a) Using a truth table, prove the following theorem:

$$\text{NOT}(X + Y) = \text{NOT}(X) \cdot \text{NOT}(Y) \quad (5/100)$$

- (b) Draw a logic circuit diagram for the following Boolean function (without simplifying it):

$$Z = (A \oplus B) \cdot (\text{NOT } C) \cdot (A + B) \quad (5/100)$$

2. Complete the following, showing all the intermediate steps:

- (a) Multiply 38105_9 with 47_9 directly (without using base 10), giving your answer in base 9. (5/100)

- (b) Convert 1735.46_8 into hexadecimal (without using base 10 as intermediate). (5/100)

- (c) Multiply 246_{BCD} with 7_{BCD} directly, giving your answer in BCD. (5/100)

- (d) Convert 11101.1_2 into BCD. (5/100)

3. (a) What is meant by related bases? Selected two other bases which are related to base 3. By using a suitable example, show how direct conversion can be done between base 3 and one of your selected base. (5/100)

- (b) Add the following numbers, using 2's complement binary format (4 bits, with first bit as sign bit). For each case, indicate if there's a carry and overflow. Comment on the result obtained, whether or not it is correct. Explain why.

(i) $4 + 6$

(ii) $(-4) - 2$

(iii) $(-4) - 6$

(10/100)

- (c) One format for storing a floating point number is SEEMMMMM₇, where all the digits are in base 7. The sign digit (S) is 0 for a positive number and 6 for negative number. Exponents (EE) are stored in base 7 using excess-Z method. The decimal point is at the beginning of the mantissa. What is a suitable value that can be chosen for Z? Explain your answer.

(5/100)

4. (a) Explain briefly the role played by registers MAR, MDR, IR and PC in program execution. Use suitable example(s) to explain your answer.

(10/100)

- (b) Consider the following memory contents:

Location	Content
100	500
200	400
300	800
400	700
500	300
600	200
700	900
800	1000
900	100
1000	600

Register	Content
X	500
Base	100
PC	700
Index	400

When instruction LOAD 200 or LOAD X is given (where appropriate), what is the value loaded (from the memory) for each of the addressing mode below:

- (i) immediate
- (ii) direct or absolute
- (iii) register
- (iv) base offset
- (v) relative
- (vi) indirect
- (vii) register indirect
- (viii) indexed
- (ix) indexed indirect
- (x) indirect indexed

(10/100)

5. (a) What is an interrupt? Briefly explain who uses it, and how. (10/100)
- (b) What is Direct Memory Access (DMA)? Explain your answer in terms of implementation, usage and benefits obtained, when compared to other related techniques. (10/100)
- (c) Compare the workings of cache memory, virtual memory and disk cache. (10/100)