INSTITUTE OF TECHNOLOGY TRALEE

Semester 2 REPEAT Examinations 2010

<u>Computer Architecture</u>
(CRN 43829)

Internal Examiners: Ms Mairead O'Sullivan
External Examiner: Dr Barry Feeney

Duration: 2 Hours

Instructions to Candidates: Answer any THREE Questions.

Question One   *33 Marks*

(a)   Convert the binary number 100111 to its decimal and hexadecimal equivalent.
                                                                                    (8 Marks)

(b)   Show the logic symbol **and** the truth table for: *(8 Marks)*

   (i) OR gate (2 input) (ii)   NAND gate (2 input)

(c)   Complete the truth table for the expression below: *(9 Marks)*

$$Z = (\overline{A} + C) + B \oplus C$$

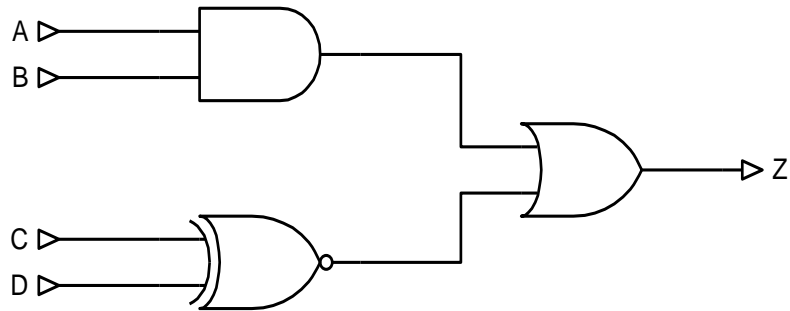(d)   Draw the circuit for the expression below: *(8 Marks)*

$$Z = (A \oplus B) + \overline{CD}$$

Question Two *(33 Marks)*

(a)   Write an expression for the circuit given below:

(10 Marks)

(b)   Simplify the following expression:

$$Z = X(Y.1 + Y.0 + \overline{X}Y) + W(W + \overline{W}V)$$

(11 Marks)

(c)   Write an expression for Z below. Simplify the expression if possible and draw the circuit.

(12 Marks)

A	B	C	Z
0	0	0	0
0	0	1	1
0	1	0	0
0	1	1	0
1	0	0	1
1	0	1	1
1	1	0	0
1	1	1	0

Question Three   (33 Marks)

(a)   Show the truth table and the logic symbol for the Half-Adder.

                                                                            (12 Marks)

(b)   How many locations in memory can be addressed by a CPU which has a 20-bit
        address bus.

                                                                            (10 Marks)

(c)   Write a short note on Random Access Memory (RAM), discussing Static-RAM and
        Dynamic-RAM and highlighting the differences between them. How does ROM differ
        from RAM?

                                                                            (11 Marks)

Question Four   (33 Marks)

(a)   Explain the function of the address bus and data bus in a CPU. What is the
        significance of the data bus size?

                                                                            (12 Marks)

(b)   Draw a block diagram of a generic CPU, and write a short paragraph describing the
        function of each component.

                                                                            (11 marks)

(c)   Write a note on cache memory.

                                                                            (10 Marks)

Rules of Boolean Algebra

1	$A + O = A$
2	$A + 1 = 1$
3	$A \cdot O = O$
4	$A \cdot 1 = A$
5	$A + A = A$
6	$A + \overline{A} = 1$
7	$A \cdot A = A$
8	$A \cdot \overline{A} = O$
9	$\overline{\overline{A}} = A$
10	$A + AB = A$
11	$A + \overline{A}B = A + B$
12	$(A + B)(A + C) = A + BC$

Laws of Boolean Algebra

Commutative	$A + B = B + A$ $AB = BA$
Associative	$A + (B + C) = (A + B) + C$ $A(BC) = (AB)C$
Distributive	$A(B + C) = AB + AC$