



Institiúid Teicneolaíochta, Trá Lí  
INSTITUTE OF TECHNOLOGY - TRALEE

SUMMER EXAMINATION, 2011  
AY 2010/2011

**COMPUTER ARCHITECTURE**  
**CRN: 43828**

**Internal Examiner:** Ms. M. O'Sullivan  
**External Examiner:** Dr. B. Feeney

**Duration of Exam:** **2 HOURS**

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**Instructions to Candidates:** Answer **ANY THREE** questions.

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**Question One**

**(33 Marks)**

- (i) Convert the hexadecimal number 3B to its binary **and** decimal equivalent. (8 Marks)
- (ii) Show the logic symbol **and** the truth table for: (8 Marks)
- (i) NAND gate (2 input)      (ii) XOR gate
- (iii) Complete the truth table for the expression below: (9 Marks)

$$Z = A\bar{C} + \overline{B + D}$$

- (iv) Draw the circuit for the expression below: (8 Marks)

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

## Question Two

(33 Marks)

- (i) Write an expression for the circuit given below:

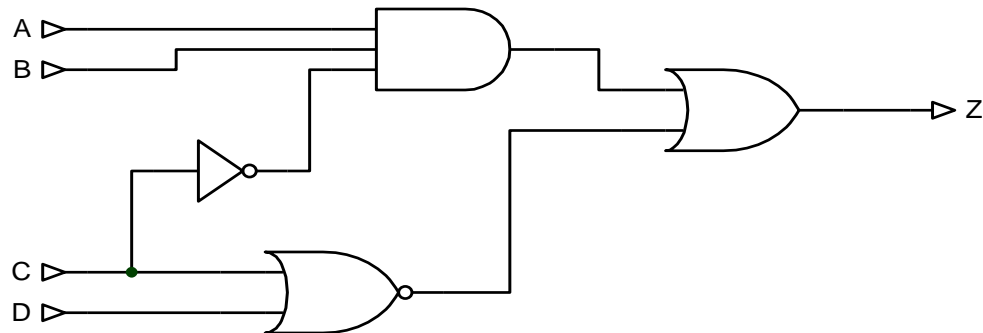


Figure 1

(10 Marks)

- (ii) Simplify the following expression:

$$Z = A(A.1 + AD + \overline{A}CD) + B(0 + \overline{B}CD + \overline{D})$$

(11 Marks)

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

(12 Marks)

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

**Question Three****(33 Marks)**

- (i) Show the truth table for the Full-Adder. Hence or otherwise, write the equation for the Full-Adder and show the logic circuits required to implement it. (12 Marks)
- (ii) Using the adder(s) shown in figure 2, or otherwise, design a circuit to add two eight bit numbers  $A_7 \dots A_0$  and  $B_7 \dots B_0$ .

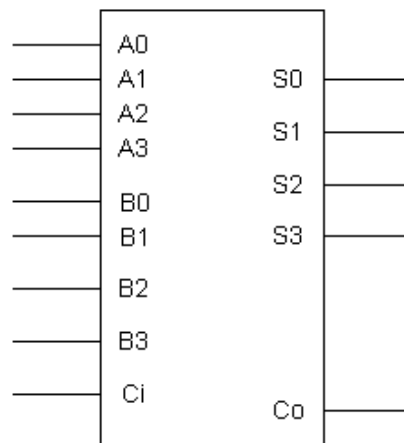


Figure 2

- (iii) 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)**

- (i) If a CPU clock operates at 2.5 GHz, what is the cycle length expressed in nano seconds. (12 Marks)
- (ii) Draw a block diagram of a generic CPU, and write a short paragraph describing the function of each component. (11 marks)
- (iii) Write a note on Cache Memory. (10 Marks)

## Rules of Boolean Algebra

1	$A + 0 = A$
2	$A + 1 = 1$
3	$A \cdot 0 = 0$
4	$A \cdot 1 = A$
5	$A + A = A$
6	$A + \overline{A} = 1$
7	$A \cdot A = A$
8	$A \cdot \overline{A} = 0$
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	$A(B + C) = AB + AC$