CPS 104 Midterm Exam

Prof. Gershon Kedem
Spring 1999

Closed Book, 1 hour.
Answer all questions:
Please make sure that your exam has all 6 pages
Put your name on each page.

Your Name: _____

Student ID: _____

Problem 1: (20 pt) _____

Problem 2: (20 pt) _____

Problem 3: (20 pt) _____

Problem 4: (20 pt) _____

Problem 5: (20 pt) _____

Total: _____

 Your Name: _____

1. a. (6 pt) Show the truth table for a three-input one-output **GTE5** function. The function value is 1 if the 3-digit number **<In2, In1, In0>**$_2$ is greater or equal to 5_{10}, otherwise the value is 0.

In2	In1	In0	GTE5

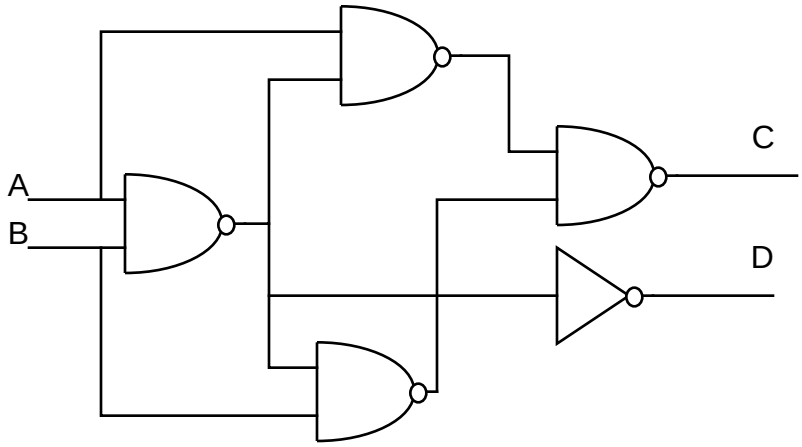
b. (8 pt) Write down Boolean expression for the **GTE5** function. Simplify the expression as much as you can.

c. (6 pt) Draw a circuit diagram for the Boolean function GTE5 Use only **AND**, **OR** and **NOT** (Inverter) gates.

Your Name: ___________________________________

 Your Name: _____

2. a. (15 pt)Construct a truth table for the following circuit:



A	B	D	C

b. (5 pt) What does the circuit do?

3. The following are two 12-bit two's complement numbers:

A = 011101011010
B = 111000110101

a. (7 pt) Compute **A+B** and **B-A** in 12-bit two's complement.

A + B = _____ **B - A** = _____

b. (7 pt) Convert **A** and **B** to 16-bit two's complement numbers and compute **A+B** and **B–A** in 16-bit two's complement.

A + B = _____ **B - A** = _____

c. (6 pt) Write the results in part **b.** as HEX numbers

A + B = 0x_____ **B - A** = 0x_____

4. (20 pt) Consider the following C++ code fragments for a 32-bit machine:

```
class List_node {
public:
  int Key;
  int Value;
  List_node *previous;
  List_node *next;
} ;

• • •
List_node* p = new List_node ;
```

The value of **p** is: **0x0042a282**. What is the address of **p->previous**? That is, what is the value of **&(p->previous)**?

&(p->previous) = _____

5. (20 pt) Consider the following C++ code fragments:

```
int sum, i, Array_A[100];

• • •

sum = 0;
for( i=0; i<100; i++)
  sum = sum + Array_A[i];
cout << sum;
```

Write a MIPS assembly code fragment that accomplishes the same task. Assume that the space for the integer array `Array_A` was already allocated and it was labeled `Array_A`. Comment your code!