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EEL3744C
HW 1

M&M problems

2.2

A major disadvantage of the absolute assembler is that the source file must contain all of the source code intended to be in the program. A relocatable assembler can overcome the disadvantages of the absolute assembler. The relocatable assembler accepts a program, or a program segment, as a source file. The source file does not need to be the complete program, nor does it need to contain location information or ORG directives. Program can be split into multiple source files and assembled at different times.

2.3

A controller's memory map, which shows what memory addresses are used for what type of memory, is used to show the memory organization in a computer. A typical microcontroller's memory map may contain RAM, EEPROM, Flash, and even spaces with memory

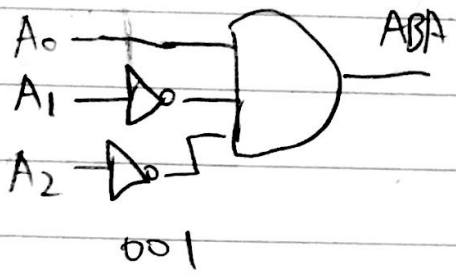
2.12

Through a set of three-state gates, the input interface connects an input device to the data bus. The input three-state gates are activated when the address of the input device is placed on the address bus and the Read_L control signal is asserted. Tristate gates (tristate buffers) are used when we want to connect to a bus which allows multiple signals to travel along the same connection. We allow multiple output devices to share a single bus.

2.17

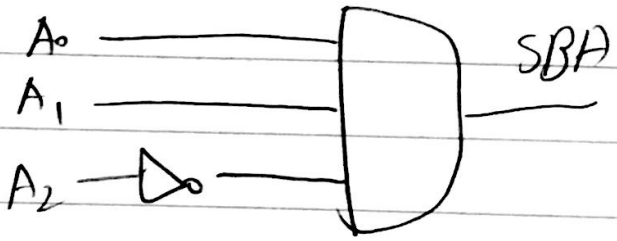
operation	opcode
ABA	001
SBA	011
IN	101
Out	111
MOV	010

ABA



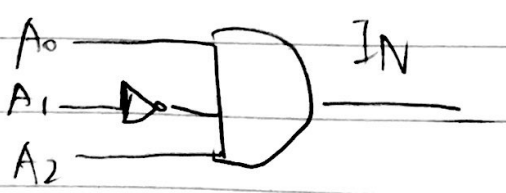
001

SBA



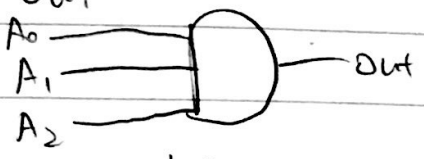
011

IN

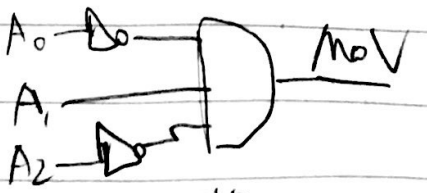


101

Out



111



010

you can combine them all in one circuit if needed to. But drawing this like this makes everything easier to see

3.2

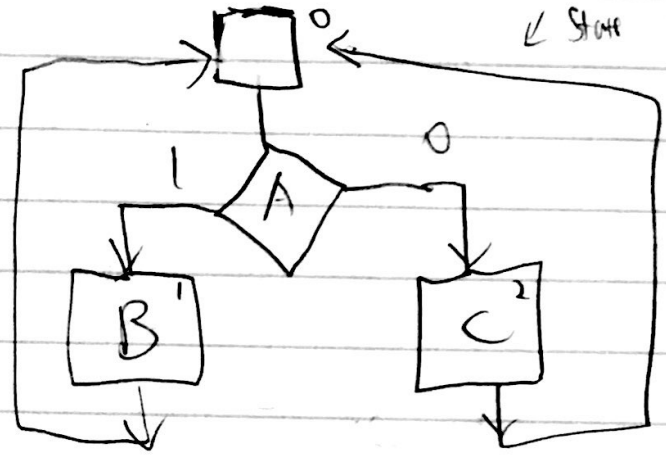
The three basic elements of structured programming are a sequence, a decision, and a repetition.

3.3

Pseudocode

(comment check) → if a = 1
B = 1

else → (check) else
C = 1



↙ State machine diagram (flowchart)

3.7

English letter pseudocode

// this pseudocode follows an english sentence with C++ format

// prompt user to enter a character (call it var)

while (var is not equal to ESC) {
if (var = alphabetic = uppercase) {
change it to lowercase case
Cout var }
else if (var = alphabetic = lowercase) {
change it to uppercase case
Cout var }
else if (var = numeric) {
Cout var } → next page

↓ from last page

```
else {
    beep the bell
}                    // end if statement
}                    // end while loop
```

4.5

It just means that the most significant bit is a 1 or 0. There can be no negative result in unsigned binary number computation.

4.6

Sign bit = 1 when two's complement binary coded numbers are added means the number is negative

4.7

Carry bit = 1 when unsigned binary coded numbers are added means there an overflow has occurred. An overflow occurs when the result of an arithmetic operation cannot be represented by the number of bits available

4.11

Nothing, two's complement overflow bit is not used for unsigned binary coded numbers

4.12

When two's-complement overflow bit = 1 after a two's complement binary coded number addition, it means an overflow has occured. An overflow occurs when the result of an arithmetic operation cannot be represented by the number of bits available. The two's-complement overflow bit is used for 2's complement binary coded number. Similar to how the carry bit is used for unsigned numbers

5.1

For the XMEGA that we are studying, there are direct addressing mode, indirect addressing mode, extended addressing mode, constant addressing mode, and relative addressing mode. These are taken from Dr. Schwartz lecture slide notes

5.2

- **Physical address** is the actual address that must be supplied to the memory. The number of bits in the physical address fixes the maximum number of memory locations that can be addressed.
- **Effective address** refers to an address that is calculated by the processor. The effective address may be a physical or logical address that is the actual address of the operand
- A **memory or I/O map** shows what addresses are used for what purposes. A memory map may show which addresses contain ROM and which contain RAM, as well as any that have no memory installed at all.

5.9 To increase the memory address space in a computer system, one must (c) increase the number of address lines

5.10 A point is (b) a memory address held in a register

5.11 A register indirect addressing (b) has the address of the operand in a register