* Please follow these instructions EXACTLY.
* Print out this document. All of the answers will be hand-written on this document
* Put your name on the document.
* Write your answers legibly. If I can’t read it, it’s wrong.
* Show your work on these pages.. You may draw/scribble on them.
* The day of the Final Exam, physically hand in this document
* You may hand in this assignment early. Do so at my office.

1. Convert unsigned Decimal **86** to
   1. Binary \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
   2. Hex \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
2. Convert signed decimal value **-120** to
   1. Binary \_\_\_\_\_\_\_\_\_\_\_\_
3. Convert signed decimal value **200.0625**
   1. Binary \_\_\_\_\_\_\_\_\_\_\_\_ . \_\_\_\_\_\_\_\_\_\_\_\_
4. If a computer uses 8-bit two’s complement as a signed integer representation, what is the
   1. Largest number (positive), in decimal \_\_\_\_\_\_\_\_\_\_
   2. Smallest number (negative), in decimal \_\_\_\_\_\_\_\_\_\_
   3. Largest number (positive), in binary \_\_\_\_\_\_\_\_\_\_
   4. Smallest number (negative), in binary. \_\_\_\_\_\_\_\_\_\_
5. How many bits are required to address a **32M x 16** main memory (this notation means the memory has **32x220** words and each word has 16 bits)
   1. Main memory is word-addressable. \_\_\_\_\_\_\_\_
   2. Main memory is byte-addressable. \_\_\_\_\_\_\_\_
6. Simplify: **F(x,y,z) = (x + y) (x + y’) (xz’)’**
   1. Answer: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
7. Simplify using a Karnaugh Map:

**x’y’z’ + xy’z’ + x’y’z + xyz’ + x’yz + x’yz’**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| X \ YZ | 00 | 01 | 11 | 10 |
| 0 | 1 | 1 | 1 | 1 |
| 1 | 1 | 0 | 0 | 1 |

Answer: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. Write the Boolean expression in the Sum-of-products form

|  |  |  |  |
| --- | --- | --- | --- |
| **X** | **Y** | **Z** | **F** |
| 0 | 0 | 0 | 1 |
| 0 | 0 | 1 | 0 |
| 0 | 1 | 0 | 1 |
| 0 | 1 | 1 | 0 |
| 1 | 0 | 0 | 0 |
| 1 | 0 | 1 | 1 |
| 1 | 1 | 0 | 1 |
| 1 | 1 | 1 | 1 |

Boolean Expression: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. What is the 1 gate that is considered the Universal Gate? \_\_\_\_\_\_\_\_\_\_
2. List the two types of sequential Circuits?
   1. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
   2. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
3. Assume you have a byte-addressable machine that uses 32-bit integers and you are storing the Hex value **2B31** at address 0.
   1. How is this value stored on a Big Endian machine?
   2. How is this value stored on a Little Endian Machine?

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Address | 00 | 01 | 10 | 11 |
| Big Endian |  |  |  |  |
| Little Endian |  |  |  |  |

1. If I want to design a two-byte register, how many D flip-flops do I need?
   1. \_\_\_\_\_\_\_\_\_\_
2. Consider the MARIE program below. What is stored in the AC when the program completes?

Answer: \_\_\_\_\_\_\_\_\_\_\_\_

|  |  |  |
| --- | --- | --- |
| Hex  Address | Label,  Start | Instruction |
| 100 |  | LOAD A |
| 101 |  | LOAD B |
| 102 |  | STORE D |
| 103 |  | CLEAR |
| 104 |  | OUTPUT |
| 105 |  | ADDI D |
| 106 |  | STORE B |
| 107 |  | HALT |
| 108 | A, | HEX OOFC |
| **109** | **B,** | **DEC 266** |
| 10A | C, | HEX 0108 |
| 10B | D, | HEX 0000 |