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CSE 313 (MW 12pm)

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**Homework 1**

Chapter 2:

Convert the following 2’s complement binary numbers to decimal. (1010 and 01011010)

2.10a.) 1010 = (1\*23) + (0\*22) + (1\*21) + (0\*20) = 8 + 2 = **10**

2.10b.) 01011010 = (0\*27) + (1\*26) + (0\*25) + (1\*24) + (1\*23) + (0\*22) + (1\*21) + (0\*20) = **90**

Convert these decimal numbers to 8-bit 2’s complement binary numbers. (102 and -128)

2.11a.)

= 0

= 1

= 1

= 0

= 0

= 1

1 = 1

102 in 8-bit binary is 01100110

102 in 8-bit 2’s complement is **10011010**

2.11d.)

= 0

= 0

= 0

= 0

= 0

= 0

-1 = 0

-128 in 8-bit binary is 10000000

-128 in 8-bit 2’s complement is **10000000**

Add the following unsigned binary numbers. Also, express the answer in decimal (01+1011 and 0101+110)

2.17a.) 01

+ 1100

**1101** (1\*23) + (1\*22) + (0\*21) + (1\*20) = 8 + 4 + 1 = **13ten**

2.17c.) 110

+ 0101

**1011** (1\*23) + (0\*22) + (1\*21) + (1\*20) = 8 + 2 + 1 = **11ten**

You wish to express -64 as a 2’s complement number

2.26a.) How many bits do you need (the minimum number)

= 0

= 0

= 0

= 0

= 0

= 1

1000000 = **7-bits**

2.26b.) With this number of bits, what is the largest positive number you can represent? (Answer in both decimal and binary).

Largest positive number you can represent with 7-bits

27 – 1 = **127**

= 1

= 1

= 1

= 1

= 1

= 1

1 = 1

127 in binary is **1111111**

2.26c.) With this number of bits, what is the largest unsigned number you can represent? (Answer in both decimal and binary).

Largest unsigned number you can represent with 7-bits

27 – 1 = **127**

= 1

= 1

= 1

= 1

= 1

= 1

1 = 1

127 in binary is **1111111**

Compute the following

2.34b.) NOT (1000 AND (1100 OR 0101)) = **0111**

1100 1000

or 0101 and 1101 not 1000

1101 1000 0111

2.34d.) (0110 OR 0000) AND 1111 = **0110**

0110 0110

or 0000 and 1111

0110 0110

Write IEEE floating point representation of the following decimal numbers

2.39a.) 3.75 = **01000000011100000000000000000000**

|  |  |  |
| --- | --- | --- |
| 0 | 10000000 | 11100000000000000000000 |

Sign (1-bit) Exponent (8-bits) Fraction (23-bits)

3 in binary is **11**

0.75 x 2 = **1**.5 11.11 x 21 = 1.111 🡨 fraction (11100000000000000000000)

0.5 x 2 = **1** exponent (1) 🡪 1 + 127 = 128 = 10000000

2.39d.) 64,000 = **01000111011101000000000000000000**

|  |  |  |
| --- | --- | --- |
| 0 | 10001110 | 11101000000000000000000 |

Sign (1-bit) Exponent (8-bits) Fraction (23-bits)

64,000.0 in binary is 1111101000000000

1. x 2 = 0
2. 1111101000000000 x 215 = 1.11101000000000 🡨fraction (11101000000000000000000)

Exponent (15) 🡪 15 + 127 = 142 = 1111110

Convert the following hexadecimal representations of 2’s complement binary numbers to decimal numbers

2.47a.) xF0 = 11110000

F = 1111 0 = 0000

(1\*27) + (1\*26) + (1\*25) + (1\*24) + (0\*23) + (0\*22) + (0\*21) + (0\*20) = 128 + 64 + 32 + 16 = **240**

2.47c.) x16 = 00010110

1 = 0001 6 = 0110

(0\*27) + (0\*26) + (0\*25) + (1\*24) + (0\*23) + (1\*22) + (1\*21) + (0\*20) = 16 + 4 + 2 = **22**

Chapter 3:

3.1.) In the following table, write whether each type of transistor will act as an open circuit or a closed circuit.

|  |  |  |
| --- | --- | --- |
|  | n-type | p-type |
| Gate = 1 | **Closed Circuit** | **Open Circuit** |
| Gate = 0 | **Open Circuit** | **Closed Circuit** |

3.9.) Fill in the truth table for the logical expression NOT(NOT(A) OR NOT(B)). What single logic gate has the same truth table?

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| A | B | NOT(A) | NOT(B) | NOT(A) OR NOT(B) | NOT(NOT(A) OR NOT(B)) |
| 0 | 0 | 1 | 0 | 1 | **0** |
| 0 | 1 | 1 | 0 | 1 | **0** |
| 1 | 0 | 0 | 1 | 1 | **0** |
| 1 | 1 | 0 | 0 | 0 | **1** |

3.10.) Fill in the truth table for a two-input NOR gate.

|  |  |
| --- | --- |
| A B | A NOR B |
| 0 0 | **1** |
| 0 1 | **0** |
| 1 0 | **0** |
| 1 1 | **0** |

3.23.) Given the logic circuit, fill in the truth table for the output value Z.

|  |  |  |  |
| --- | --- | --- | --- |
| A | B | C | Z |
| 0 | 0 | 0 | **0** |
| 0 | 0 | 1 | **0** |
| 0 | 1 | 0 | **0** |
| 0 | 1 | 1 | **0** |
| 1 | 0 | 0 | **0** |
| 1 | 0 | 1 | **0** |
| 1 | 1 | 0 | **0** |
| 1 | 1 | 1 | **0** |

A

B Z

C

= OR = AND = NOT