

## Digital Circuits: Homeworks #1 Solutions

### 1. 2-7(a)(e).

Convert each binary number to decimal

(a) 110011.11

(b) 1011100.10101

**Solution: 2-7(a)(e).**

(a)

$$2^{-2} + 2^{-1} + 2^0 + 2^1 + 2^4 + 2^5 = 51.75 \quad (1)$$

(b)

$$2^{-5} + 2^{-3} + 2^{-1} + 2^2 + 2^3 + 2^4 + 2^6 = 92.65625 \quad (2)$$

### 2. 2-11(h).

Convert each decimal number to binary

(a) 198

**Solution: 2-11(h).**

(a)

$$198 = 2^7 + 2^6 + 2^2 + 2^1 \quad (3)$$

Thus, 11000110.

### 3. 2-15(d)

Add the binary numbers

(a) 111+101

**Solution: 2-15(d).**

(a) 1100

### 4. 2-17(e)

Perform the following binary multiplications

(a)  $1110 \times 1110$

**Solution: 2-17(e).**

(a) 11000100

5. **2-22(h)**

Determine the 2's complement of each binary number

(a) 11000111

**Solution: 2-22(h).**

(a) 00111001

6. **2-25(c)(d)**

Express each decimal number as an 8-bit number in the 2's complement form

(a) +101

(b) -125

**Solution: 2-25(c)(d).**

(a) 01100101

(b) 10000011

7. **3-5**

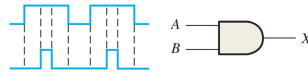


Figure 1: waveform

Determine the output,  $X$ , for each 2-input gate with the input waveforms shown in Figure 1. Show the proper relationship of output to inputs with a timing diagram.

(a) AND-gate

(b) OR-gate

(c) NAND-gate

(d) NOR-gate

(e) XOR-gate

(f) XNOR-gate

**Solution: 3-5.**

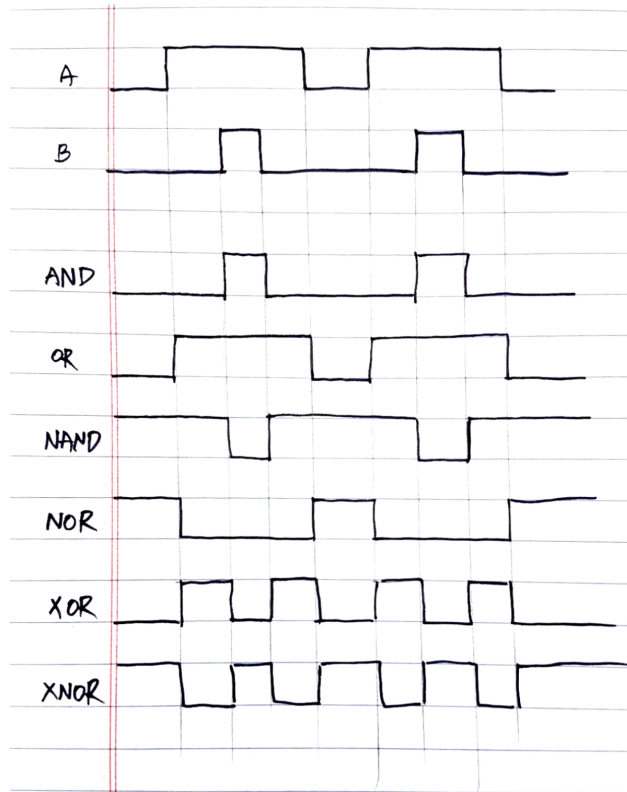


Figure 2: waveforms