Homework 1 Solutions for Computer Logic and Circuit Design: PHYS306/COSC330

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1 1-2: Binary Digits, Logic Levels, and Digital Waveforms

1. Exercise 7: a) 0.6 μs, from 0.2 to 0.8 μs. Remeber the convention is 10-90 percent of the amplitude. b) 0.55 μs. c) 2.7 μs. d) 10 V.

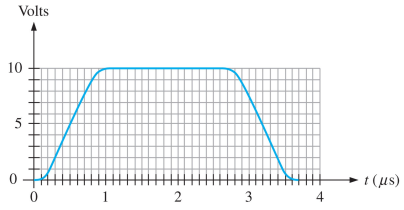

Figure 1: The digital pulse for exercise 7.

2. Exercise 8: The period is 4 ms.
3. Exercise 9: The frequency is the inverse of the period, so 0.25 kHz.

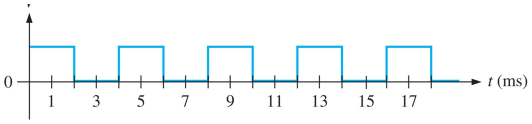

Figure 2: The bitstream/timing diagram for exercise 8.

4. Exercise 10: This is an example of a periodic signal. (*It's a clock signal*).
5. Exercise 11: The duty cycle is 50%. The pulse width is 2 ms and the period is 4 ms so the ratio is one-half.
6. Exercise 14: The period is the inverse of the frequency, so 10/35 ns, or 0.286 ns.

2 1-3: Basic Logic Functions

1. Exercise 15: We have to account for all the information, so the best answer is $LD0 = SW1 \mid SW2$. That is $LD0 = SW1$ OR $SW2$.

3 1-7: Test and Measurement Instruments

1. Exercise 30: This is like a units problem, $2V/div \times 3div = 6V$.
2. Exercise 31: This is like a units problem, $2ms/div \times 4div = 8ms$.
3. Exercise 32: This is like a units problem, $12MS/s \times 2ms = 12 \times 10^6 \times 10^{-3} = 24,000$ samples.

4 2-2: Binary Numbers

1. Exercise 6: Convert the following binary numbers to decimal:
    - (a) 14
    - (b) 10
    - (c) 28
    - (d) 16
    - (e) 21
    - (f) 29
    - (g) 23
    - (h) $31 \rightarrow 2^5 - 1$

5 2-4: Binary Arithmetic

1. Exercise 15:
    - (a) 100 (4)
    - (b) 100 (4)
    - (c) 1000 (8)
    - (d) 1101 (13)
    - (e) 1110 (14)
    - (f) 11000 (24)
2. Exercise 17:
    - (a) 1001 (9)
    - (b) 1000 (8)
    - (c) 100011 (35)
    - (d) 110110 (58)
    - (e) 1010 1001 (169) ... with this number of total bits, verify in decimal (1101 = 13, 13 x 13 = 169)
    - (f) 1011 0110 (182) ... (14 x 13 = 182)