# Computer Science: An Overview
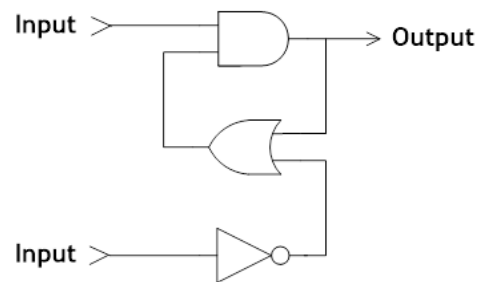# Homework Set 1

**1.** (2') In the following flip-flop, what is the output when

1) both inputs remain 0?

2) both inputs remain 1?

3) the upper input remains 0 and the lower remains 1?

4) the upper input remains 1 and the lower remains 0?



Choose one of the following options for each case and fill it in the form (in uppercase).

A. 1    B. 0    C. Switch between 0 and 1    D. Keep the previous output

| (1) | B | (2) | D |
|-----|---|-----|---|
| (3) | B | (4) | A |

**2.** (2') Encode the following values to their equivalent **8-bit two's complement representation** (Fill an 8-bit 0/1 string in the form, e.g., 00000001).

a. -12          b. 5          c. -1          d. 16

| a. | 11110100 | b. | 00000101 |
|----|----------|----|----------|
| c. | 11111111 | d. | 00010000 |

**3.** (2') Perform the following additions. The bit patterns represent values in **8-bit two's complement representation**. The answers should also be given in **8-bit two's complement representation**. Hint: overflows may occur in some cases. (Fill an 8-bit 0/1 string in the form, e.g., 00000001)

a. 00100010 + 01000100          b. 10101010 + 01010101

c. 11101010 + 11000011          d. 01001110 + 01001110

| a. | 01100110 | b. | 11111111 |
|---|---|---|---|
| c. | 10101101 | d. | 10010000 |

**4.** (2') Encode the following values using the **8-bit floating-point format** discussed in class (Fill an 8-bit 0/1 string in the form, e.g., 00000001).

a. $7\frac{1}{2}$          b. $-3\frac{3}{4}$          c. $\frac{15}{16}$          d. $-1$

| a. | 01111111 | b. | 11101111 |
|---|---|---|---|
| c. | 01001111 | d. | 11011000 |

**5.** (2') In each of the following problems, interpret the bit patterns using the **8-bit floating-point format**, add the values represented and encode the answer in the same floating-point format. Hint: truncation errors may occur in some cases. (Fill an 8-bit 0/1 string in the form, e.g., 00000001)

a. 11011100 + 11101000          b. 01001010 + 00111000
c. 01111000 + 00011000          d. 11011000 + 11011000

| a. | 11101110 | b. | 01001110 |
|---|---|---|---|
| c. | 01111000 | d. | 11101000 |