



Université d'Ottawa • University of Ottawa

**Faculté de Génie - Faculty of Engineering
ITI1100C Digital Systems I –Assignment 1**

Due date: February 3, 2023 – 11:59 PM EST

Professor: **Mohammad Al Ridhawi**

- 1) Convert the following numbers with the indicated bases to decimal:
 - (a) $(4310)_5$
 - (b) $(198)_{12}$
 - (c) $(435)_8$
 - (d) $(345)_6$
- 2) What is the largest binary number that can be expressed with 16 bits? What are the equivalent decimal and hexadecimal numbers?
- 3) Convert the hexadecimal number 64CD to binary, and then convert it from binary to octal.
- 4) Convert the decimal number 431 to binary in two ways:
 - (a) Convert directly to binary.
 - (b) Convert first to hexadecimal and then from hexadecimal to binary. Which method is faster?
- 5) Express the following numbers in decimal:
 - (a) $(10110.0101)_2$
 - (b) $(16.5)_{16}$
 - (c) $(26.24)_8$
 - (d) $(DADA.B)_{16}$
 - (e) $(1010.1101)_2$
- 6) Convert the following binary numbers to hexadecimal and to decimal:
 - (a) 1.10010, (b) 110.010.

Explain why the decimal answer in (b) is 4 times that in (a).
- 7) Perform the following division in binary: $111011 \div 101$.
- 8) Do the following conversion problems:
 - (a) Convert decimal 27.315 to binary.
 - (b) Calculate the binary equivalent of $2/3$ out to eight places. Then convert from binary to decimal. How close is the result to $2/3$?
 - (c) Convert the binary result in (b) into hexadecimal. Then convert the result to decimal. Is the answer the same?

9) Obtain the 1's and 2's complements of the following binary numbers:

- (a) 00010000 (b) 00000000
(c) 11011010 (d) 10101010
(e) 10000101 (f) 11111111.

10) Find the 9's and the 10's complement of the following decimal numbers:

- (a) 25,478,036 (b) 63, 325, 600 (c) 25,000,000 (d) 00,000,000.

11) (a) Find the 16's complement of C3DF.

(b) Convert C3DF to binary.

(c) Find the 2's complement of the result in (b).

(d) Convert the answer in (c) to hexadecimal and compare with the answer in (a).

12) Perform subtraction on the given unsigned numbers using the 10's complement of the subtrahend. Where the result should be negative, find its 10's complement and affix a minus sign. Verify your answers.

- (a) 4,637 - 2,579 (b) 125 - 1,800
(c) 2,043 - 4,361 (d) 1,631 - 745

13) Perform subtraction on the given unsigned binary numbers using the 2's complement of the subtrahend. Where the result should be negative, find its 2's complement and affix a minus sign.

- (a) 10011 - 10010 (b) 100010 - 100110
(c) 1001 - 110101 (d) 101000 - 10101

14) Convert decimal +49 and +29 to binary, using the signed-2's-complement representation and enough digits to accommodate the numbers. Then perform the binary equivalent of $(+29) + (-49)$, $(-29) + (+49)$, and $(-29) + (-49)$. Convert the answers back to decimal and verify that they are correct.

15) If the numbers $(+9,742)_{10}$ and $(+641)_{10}$ are in signed magnitude format, their sum is $(+10,383)_{10}$ and requires five digits and a sign. Convert the numbers to signed-10's-complement form and find the following sums:

- (a) $(+9,742) + (+641)$ (b) $(+9,742) + (-641)$
(c) $(-9,742) + (+641)$ (d) $(-9,742) + (-641)$