

EE1005 – Digital Logic Design

Assignment 1

Spring 2023

Maximum Marks: 100

Due Date: 17 February 2023

Instructions:

- Strictly follow **assignment norms** provided.
- Partially or fully **copied assignments** will be marked as **zero**.
- Late submissions are not allowed.
- Clearly indicate all the calculations in your solution. No points will be awarded in case of missing calculations.
- You can submit your assignment **before 5:00 PM** on/before due date.

Question Number 1

(6 marks)

Your student ID has four digits in it (for example 20F-0123), the four digits are 0, 1, 2 and 3. What are the minimum number of bits required to represent

- a) Sum of all the four digits of your students ID (unsigned)
- b) Sum of all the four digits of your student ID (signed)
- c) The negative of your student ID (for example, if student ID is 20F-0123, you need to find the minimum number of bits required to represent -123)

Question Number 2

(4 marks)

What is the hex representation of each of the following binary numbers?

- a) 1 1001 1101 . 0011 0101 11
- b) 10 0111 0101 0100 1110 1110 1000
- c) 1001 1101 0101 0011 1110 . 0011 1100 0000 11
- d) 1000 0111 1111 0100 0011 1000 1100 1010

Question Number 3

(8 marks)

The following binary numbers are represented in 2's complement form. Write their equivalent decimal number.

- a) 1111 1111 1111 1011
- b) 1111 1111 1111 1111 1111 1111 1111 0001
- c) 1111 1111 1111 1111 1111 1111 1111 1111
- d) 1111 1111 1111 1111 1111 1111 1111 1111 1111 1110

Question Number 4

(8 marks)

What is the decimal representation of the following signed hex numbers? (the numbers are written in r's complement form)

- a) FFFF FFFF FFFF FFDE
- b) FFFF FFFF FFFF FFEF
- c) FFFF FFFF FFFF FFDE
- d) FFFF FFFF FFFF FFE0

Question Number 5**(20 marks)**

Your student ID is written as 20F-0123. Take 20 as integer part and last four digits as fraction part. (20.0123 in case of above student ID). Then convert the resulting decimal number in binary by using 8, 12, and 16 bits. In each case convert back the number in decimal and comment about the accuracy.

Question Number 6**(15 marks)**

You are given three (8 bit) signed binary numbers A, B and C. Evaluate D by using the equation

$$D = A - B + C$$

And then verify your answer by performing same calculations in decimal. (use 2's complement where needed)

$$A = (00111110)_2 \quad B = (11010101)_2 \quad C = (11011011)_2$$

Question Number 7**(9 marks)**

Convert the following numbers from decimal to indicated base by using 8 decimal points.

- a) 40.525 to base 8
- b) 100.4 to base 16
- c) 250.45 to base 5

Question Number 8**(10 marks)**

Formulate a weighted binary code for the decimal digits, using the following weights:

- a) 6, 3, 2, 1
- b) 6, 4, 2, 1

Question Number 9**(10 marks)**

Write the ASCII code for your name by using the parity selected by your ID. If your student ID is even, then use even parity, otherwise use odd parity.

Question Number 10**(10 marks)**

Suppose that you have two decimal numbers A and B.

$$A = 998$$

$$B = \text{last four digits of your student ID (20F-0123, then } B = 0123)$$

- i. Add both these numbers by using BCD codes.
- ii. Represent the number B in
 - a) Excess-3 codes
 - b) 6,3,2,1 codes
 - c) 8,4,-2,-1 codes
 - d) Gray Code

☺ *Good Luck* ☺