İTÜ BİLGİSAYAR ve BİLİŞİM FAKÜLTESİ

# BLG 212E – Microprocessor Systems 09.11.2020

## Homework 1

## Due Date: 23.11.2020, Monday, 22:00

### Question 1

a) Calculate the following conversions. For full points, show all the steps of your calculations.
   i. What is the hexadecimal representation of the decimal number “123”?
   ii. What is the decimal representation of the number “02102210” in base 3?
   iii. What is the hexadecimal representation of the binary number “01010100”?
   iv. Using IEEE-754 32-bit single precision floating point representation, what is the representation of the decimal number “7.325”? Clearly show Mantissa and Exponent values as binary numbers.

b) Suppose X and Y are 8-bit numbers. Calculate the result of the below operations as binary. Clearly state if there is an overflow and explain how you detect the overflow.

| i. Both are unsigned.<br>X = 10110010<br>Y = 01101101<br>X + Y = ? | ii. Both are signed.<br>X = 01011100<br>Y = 00110101<br>X + Y = ? | iii. Both are signed.<br>X = 11100011<br>Y = 01111111<br>X – Y = ? |
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### Question 2

For a CPU with 8-bit data bus and 16-bit address bus, build the memory whose range is between $0000 and $7FFF with 4Kx8 memory chips.

a) Calculate range for all chips needed.
   i. What is the number of bits dedicated for chip selection?
   ii. What is the required memory space?
   iii. How many 4K chips are needed?

b) Draw the memory design by showing all necessary connections. (Address bus, Data bus, Chip select signals). Use an address decoder (determine its type) and logic gates (determine their types). Assume the decoder select signal and the memory chip select signals are active high.

**Submission**: Prepare a pdf file containing your solutions. Show each step of your solution and make comments where necessary. You should type your name and student ID at the top of the pdf file. You must submit your homework through the Ninova system before the due date.

Late submissions will not be accepted.

Assignments have to be made individually. If any plagiarism issue is detected, disciplinary regulations of the university will be applied.

Note: If you have a problem about the homework, you can contact with the research assistant of the course (esengun@itu.edu.tr).