Quiz 1
CSE 112 Computer Organization

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1. **Duration of the quiz is 40 mins, and 10 mins for scanning and uploading the solutions. No further extension of time will be given regarding this.**

2. **Question paper will be uploaded in the google classroom. Do not forget to turn in. Solutions submitted by any other means (email etc.) won't be considered for evaluation. Name the solution file (.pdf file) as (Name)_(Roll Number).**

3. **Students are required to switch on their cameras and mute themselves. Make sure you are sitting in a well lit room so that we are able to see your faces clearly. Please keep in mind that we'll be keeping a note of this and any violation can lead to some strict action against you.**

4. **The answers should be in your own handwriting and submission should be in PDF format only.**

5. **Write any assumption clearly, if any. Needless to say, only reasonable assumptions will be considered if any ambiguity is found in the question.**

6. **During the exam if you have any query, write it in the meet chat box. It will be taken into notice by us. Don't unnecessarily unmute your mic for it as it creates disturbance to others.**

7. **Calculators are NOT allowed during the exam time. ONLY use pen and paper for writing the exam.**

GOOD LUCK !!

Q1: Consider the following operation: -255 - 230.
i) Write the 2's complement representation of both the operands.

[2 marks]

ii) Perform the operation in 2's complement form itself. Show your computation.

[2 marks]

iii) Report the minimum bits required for the output of the computation correctly in 2's complement notation.
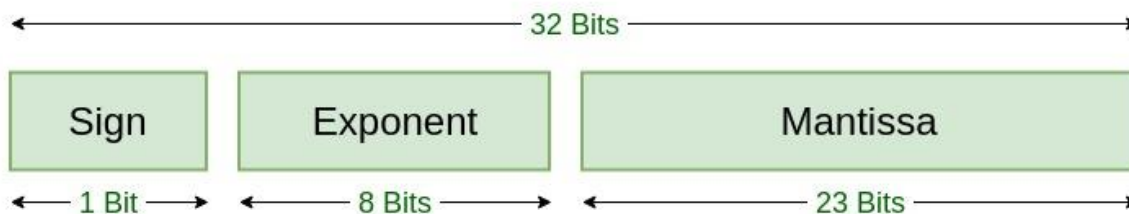
[1 marks]

Q2: Consider the following IEE754 Single Precision Floating Point Number:
0100_0000_1011_0100_0000_0000_0000_0000. Show your computation.('_' are added for clarity)

    a. What is the sign of this number (+ve or -ve) ?
    b. What is the exponent part (in decimal) ?
    c. What is the mantissa part (in binary) ?
    d. Convert the number to decimal notation.

The format for the notation is given below for your reference.

[1 + 2 + 2 + 3 = 8 marks]

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←――――――――――――――――― 32 Bits ―――――――――――――――――→

┌──────────┐  ┌────────────────┐  ┌──────────────────────────────┐
│   Sign   │  │    Exponent    │  │           Mantissa           │
└──────────┘  └────────────────┘  └──────────────────────────────┘
←― 1 Bit ―→   ←――― 8 Bits ―――→    ←――――――― 23 Bits ―――――――→
```

Single Precision
IEEE 754 Floating-Point Standard

Q3: Convert the -17.6875 (represented in decimal) to IEEE754 floating point notation. Show your computation.

[8 marks]

Q4: Consider an ISA which has **32bit** long instructions. There are two types of instructions with the following syntaxes:

    1. Type A: **\<Y bit opcode\> \<X bit address\> \<5 bit register\>**
    2. Type B: **\<Y bit opcode\> \<Z bits filler\> \<5 bit register\> \<5 bit register\>**

Type A instructions have 3 fields: the opcode, a memory address, and a register.
Type B instructions have 3 fields: the opcode, and two registers. The filler bits are useless bits to make sure that both types of instructions are of the same length of 32 bits.
Suppose the ISA supports the address space of **2MegaBytes**, with byte addressable memory.
Given this, answer the following questions:

    a. How many bits are used to represent an address in this ISA?
    b. Determine **X**?
    c. Determine **Y**?
    d. Determine **Z**?
    e. What is the maximum number of registers that this ISA can support?
    f. What is the maximum number of instructions that this ISA can support?

[6 x 2 = 12 marks]

Q5: Multiplication

    a. Multiply `1100_1100_1100_1100_1100_1100_1100_1100` ('_' are added for clarity) by 256. The number is written in 32bit unsigned notation. Explain your approach.

                                                    [3 marks]

    b. Consider the following number represented in IEEE754 notation: `0100_1010_1011_1100_1011_0000_0000_0000`. ('_' are added for clarity). What would be the result in IEEE754 notation, if we multiply this number by 2? Compute the answer **without converting the given number to decimal**. Explain your approach.

                                                    [4 marks]

THE END