BRAC UNIVERSITY
Department of Computer Science and Engineering

Examination: Mock Final | Semester: Fall24
Duration: 90 minutes | Full Marks: 40

CSE 340: Computer Architecture

Name:	ID:	Section:

1 a. **Convert -**111011.11011 x 2^{12} in 26-bit IEEE-754 format where,

i. Size of the fraction field is 13 bits. **3**

ii. Size of the fraction field is 17 bits. **3**

Show the equivalent Hex representation of your conversions.

iii. Suppose you plan to use the converted number in a subsequent calculation where precision is crucial. Given a choice between the two IEEE formats (with 13-bit and 17-bit fraction fields), which format would provide a more accurate conversion for your calculation? Justify. **1+1**

CO1

b. i. **Multiply** 0.082 and 0.198 using IEEE-754 single precision floating point representation. **2**

ii. **Show** the status of the result (overflow or underflow or none). **2**

Consider 7 decimal digits when you are converting from decimal to binary.

c. **Subtract** -6.55 from 15.21 using IEEE-754 single-precision floating-point representation. **3**

Consider 5 decimal digits when you are converting from decimal to binary.

2 a. add x_{21}, x_{22}, x_{23}
slli x_{21}, x_{21}, x_{21}
addi x_{21}, x_{21}, 4804_{Hex}
addi x_{22}, x_{21}, 15

Answer the following questions based on the above-mentioned code snippet:

i. **Identify** the error(s) present in the provided code snippet by specifying the instruction. **2**

ii. **Write** the necessary code(s) to rectify the instructions(s) **2**

CO2

b. Given a machine code
0x00CB1A93 **4**

i. Find the RISC-V assembly code of the given machine code.

ii. Draw the datapath for the instruction you found in the previous question. You must mention the necessary control signals and proper labeling for all the components. **4**

Format	Instruction	Opcode	Funct3	Funct7/Funct 6
R	ADD	0110011	001	0000000
	SUB	0110011	110	0000001
	AND	0110011	010	0000001
	OR	0110011	011	0000100
	SLL	0110011	101	0000100
I	LD	0000011	000	N/A
	LW	0000011	010	N/A
	LH	0000011	011	N/A
	LB	0000011	001	N/A
	ADDI	0010011	000	N/A
	SLLI	0010011	001	000000
	SRLI	0010011	010	000000
	ORI	0010011	011	N/A
S	SD	0100011	000	N/A
	SW	0100011	001	N/A
	SH	0100011	010	N/A
	SB	0100011	011	N/A

3 a. Explain why the Immediate Generation Unit requires the entire instruction for processing, rather than just the 12 bits of the immediate field? **3**

b. Consider the code sequence given below.

```
ld x10, 32(x11)
add x5, x10, x7
addi x5, x5, 3
ld x13, 48(x5)
sd x13, 32(x5)
```

CO3

i. Considering a single cycle datapath, find out how many clock cycles are required for the above code sequence and **calculate** the average CPI? **1+1**

ii. How many data hazards are there in the given code sequence? **1**

iii. Apply only **stall** to overcome the data hazards. **2.5**

iii. Apply only **stall + forwarding** to overcome the data hazards.

iv. Calculate the total clock cycles and average CPI required after applying the method mention in the previous question(iii). **2.5**

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