CSARCH2		September 27, 2024
Exam #1		R. Pascual, M. Peradilla, R.L. Uy
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General instructions:

1. Read ALL instructions carefully and thoroughly before proceeding to answer this exam.
2. Write, in ballpen ink, the final answers in the space provided. Answers not written in ink, and multiple answers will not be considered.
3. Write legibly. No credit will be given for messy and/or ambiguous answers.
4. **You are not allowed to use any computing devices during the exam.**
5. Cheating of any form during the exam is considered a major offense and will warrant a final grade of 0.0 in the course.

I. Understanding Integer Representation: Represent the following decimal integers to the specified integer representation. Answer in hexadecimal. If the number cannot be represented, write "N/A" [16 pts]

Decimal	12-bit Unsigned Integer	12-bit Signed Integer (2's C)	12-bit Signed Integer (S&M)	12-bit Signed Integer (1's C)
+127	07F0 0000 0000	07F0 0000 0000	07F0 0000 0000	07F0 0000 0000
-129	N/A	07F0 0000 0000	F810 0000 0000	07E0 0000 0000

Decimal	16-bit Unsigned Integer	16-bit Signed Integer (2's C)	16-bit Signed Integer (S&M)	16-bit Signed Integer (1's C)
+65535	FFFF0000 0000 0000	FFFF 0000 0000 0000	0FFF F000 0000 0000	FFFF 0000 0000 0000
-32767	N/A	8001 0000 0000 0000	F7FFF 0000 0000 0000	8000 0000 0000 0000

II. Addition and subtraction of 8-bit signed & unsigned integer (Yes/No) [10 pts]

1) $1101\ 1101_2 + 1010\ 0010_2 = ?$ 1 0111 1111 $_2$
2) If the operands in #1 are viewed as unsigned integers, is the result an overflow? (Yes/No) Yes
3) If the operands in #1 are viewed as signed integers, is the result an overflow? (Yes/No) Yes
4) $1101\ 1101_2 - 1010\ 0010_2 = ?$ 0011 1011 $_2$
5) If the operands in #4 are viewed as signed integers, is the result an overflow? (Yes/No) Yes

+2

III. Floating Point Representation [20 pts]

[for e', put space after every 4 bits]; [for fractional-part, you may use ellipsis]; [for #3&4, put space after every 4 hex digits]; [Write N/A if number can't be represented]

1.) Express $-111.01_2 \times 2^{126}$ using IEEE 754 Single Precision (Binary-32) format

Sign Bit	Exponent Representation	Mantissa representation
N/A	N/A	N/A

2.) Express $+111.01_2 \times 2^{-128}$ using IEEE 754 Single Precision (Binary-32) format

Sign Bit	Exponent Representation	Mantissa representation
0	0000 0000 0000 0000 0010	11101...0

+8

Given	IEEE-754 double precision representation (in hex)
3.) $+100.0_{10}$	1FDC
4.) -100.0_2	9FDC

IV. Understanding memory representation: If there is no equivalent, write "N/A." Special cases {Infinity | sNaN | qNaN | Denormalized} [12 pts]

Internal memory data	Representation	Decimal equivalent /Special case
0xFFFFFF08	Signed integer	qNaN
0xFE	Unsigned char	1111 1110
0x7FB00000	Single-precision float	sNaN
0xFFF0000000000000	Double-precision float	Infinity

+2

V. Floating-Point Rounding: Round using the specified methods and digits [12pts]

76.555000_{10}	5 decimal digits	4 decimal digits	3 decimal digits
Truncate	76.555	76.55	76.5
Floor/Round down	76.555	76.54	76.4
Ceiling /Roundup	76.555	76.56	76.6
Round to nearest (tie to even)	76.555	76.56	76.6

VI. Floating-Point Rounding Round using the specified methods to 6 binary bits [12pts]

	Truncate	Floor (Round down)	Ceiling (Round up)	Round to nearest (tie to even)
-110.111100_2	-110.111	-110.111	-110.110	-110.110
-101.100101_2	-101.100	-110.100	-101.101	-101.100
-100.011110_2	-100.011	-100.011	-100.010	-100.010

VII. Floating-Point operation: [18pts]
Perform the computation $1.01011100010_2 \times 2^4 + 1.00111111110_2 \times 2^5$ to six digits (use round to nearest, ties to even if needed). All answers should be in normalized form.

a) Perform without guard, round and sticky bits.

		Base^{Exp}
Operand 1	0.10101	2^5
Operand 2	1.00111	2^5
Final result	1.11100	2^5

+6

b) Perform with guard(G), round(R) and sticky(S) bits.

		G	R	S	Base^{Exp}
Operand 1	0.10101	1	1	0	2^5
Operand 2	1.00111	1	1	0	2^5
Final result	1.11101				2^5

---------- Do not write below this line ----------

I -	2 /16	III -	1 /20	V -	10 /12	VII -	0 /18	
II -	6 /10	IV -	6 / 12	VI -	3 /12			Total -