❖ Final Engr85B:

Exam due Sep 2, 2023 12:06 PDT Completed

Choice of Number System

1/1 point (graded)

You are building a machine learning accelerator. The inputs, weights, and outputs of the system are numbers in the range of (-1, 1). You wish to represent them with an error not to exceed +/- 0.001. You are doing a massive number of calculations per second and cost and power consumption are paramount concerns. Which of the following is the best number system to use?

- ○ unsigned 8-bit integers
- ○ sign/magnitude 16-bit integers
- ○ U1.15
- ◉ Q1.15
- ○ single precision floating point
- ○ double precision floating point

✔

Submit You have used 1 of 1 attempt Show answer

Fixed Point Numbers

1/1 point (graded)

Express -5.3125 in Q4.4 format. Write your answer as an 8-digit binary number with no other characters.

10101011 ✔

10101011

Submit You have used 1 of 2 attempts Save | Show answer

Floating Point Representation

1/1 point (graded)

Express the single-precision floating point number BFA00000 in decimal.

-1.25 ✔

-1.25

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Floating Point Multiplication

1/1 point (graded)

Compute the product of the following two single precision floating point numbers. Express your answer as a single-precision floating point number using eight hexadecimal digits and no other characters: BFA00000 × 40600000

c08c0000 ✔

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xor6 logic elements

1/1 point (graded)

How many logic elements are required to implement the xor6 module on a Cyclone IV FPGA?

2 ✔

2

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shiftreg logic elements

1/1 point (graded)

How many logic elements are required to implement the shiftreg module on a Cyclone IV FPGA?

4 ✔

4

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fsm logic elements

1/1 point (graded)

How many logic elements are required to implement the fsm module on a Cyclone IV FPGA?

5 ✔

5

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maindec logic elements

1/1 point (graded)

How many logic elements are required to implement the maindec module on a Cyclone IV FPGA? The output of an LE may be routed to multiple destinations to represent many signals with different names but the same logic function. An output can be tied to 0 or 1 without needing any LEs

9 ✔

9

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Code 1

1/1 point (graded)

What is A? Express your answer as a hexadecimal number with no leading 0x.

10012010 ✔

10012010

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Code 2

1/1 point (graded)

What is B? Express your answer in decimal.

11 ✔

11

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Predicted Behavior

1/1 point (graded)

What is the value of result at the end of main?

28 ✔

28

Submit You have used 1 of 2 attempts

Save | Show answer

Saving and Restoring Registers

1/1 point (graded)

Which of the following registers must be saved and restored in an assembly language implementation of main? Use the standard RISC-V register conventions.

- [x] s0
- [x] s1
- [x] s2
- [ ] s3
- [ ] a0
- [ ] a1
- [ ] a2
- [ ] t0
- [ ] t1
- [x] ra
- [ ] none of the above

✔

Submit You have used 2 of 2 attempts

Show answer

More Saving and Restoring Registers

1/1 point (graded)

Which of the following registers must be saved and restored in an assembly language implementation of f? Use the standard RISC-V register conventions.

- [ ] s0
- [ ] s1
- [ ] s2
- [ ] s3
- [x] a0
- [ ] a1
- [ ] a2
- [ ] t0
- [ ] t1
- [x] ra
- [ ] none of the above

✔

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Function Calls

1/1 point (graded)

Which assembly language code is used to call f?

- ( ) jr ra
- (•) jal f
- ( ) jr a0
- ( ) none of the above

✔

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Pipelined Behavior 1

1/1 point (graded)

What value is written to the register file on cycle 6?

7 ✔

7

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Pipelined Behavior 2

1/1 point (graded)

On which cycle is s6 written to the register file?

9 ✔

9

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Pipelined Behavior 3

1/1 point (graded)

On which cycle is s8 written to the register file?

13 ✔

13

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Test Bench: Machine Language Code

1/1 point (graded)

Modify riscvtest.s at address 18 to replace the beq with bne x5, x7, end. What is the machine language code for your new instruction. Express your answer as a 32-bit hexadecimal number with no leading 0x.

02729863 ✔

02729863

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Test Bench: More Machine Code

1/1 point (graded)

Also modify riscvtest.s at address 48 to replace the add x2, x2, x9 with add x2, x2, x7 (because x9 will not have a value). What is the machine language code for your new instruction. Express your answer as a 32-bit hexadecimal number with no leading 0x.

00710133 ✔

00710133

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Final Store Address

1/1 point (graded)

Predict the memory address to which the final sw instruction will store data. Express your answer in decimal.

44 ✔

44

Submit You have used 1 of 2 attempts Save | Show answer

Final Store Value

1/1 point (graded)

Predict the value of the data stored by the final sw instruction. Express your answer in decimal.

8 ✔

8

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SystemVerilog Changes

1/1 point (graded)

Modify the SystemVerilog to implement bne using the simplest changes you can. Which of the following modules need to be changed? Select all that apply.

- [ ] regfile
- [ ] extend
- [x] controller
- [ ] aludec
- [ ] instrdec

✔

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Hash

4.0/4.0 points (graded)

Modify riscvtest.txt with your new machine language code and modify the testbench to reflect your expected result. Simulate and debug your system. What hash did you obtain? Express your result as a hexadecimal number with no leading 0x.

e5f04be4 ✔

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