

assignment 4

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Due Date: August 4, 2021 8:00 pm - Late assignments will not be accepted. All assignment submissions must use the Moodle online submission system

Need to show all your work and units to obtain full marks

Please submit your questions as a pdf/txt or image file (png, jpg), you will be deducted or get a zero for non standard formats.

Please submit a separate file for your code with a .s extension. If it cannot run in Qt-spm you will receive a zero.

Total Marks 34 marks

1. (4 marks) Say we have a 256 bit adder. Using subword parallelism, how many addition operations of varying lengths can we perform? (Look in the slides). Then describe in your own words what subword parallelism is.
2. (10 marks) Describe the effect that a single stuck-at-0 fault (i.e., regardless of what it should be, the signal is always 0) would have for each of the following signals, in the single cycle datapath covered in class. Which instructions (considering only those that can be executed by this datapath), if any, will not work correctly? Explain why. Consider each of the following faults separately:
 - i. MemtoReg = 0
 - ii. MemRead = 0
 - iii. MemWrite = 0
 - iv. Brach = 0
 - v. RegDst = 0
3. (4 marks) Make a drawing that shows the clock cycle at which each of the instructions in the sequence given below would be completed, assuming the 5-stage MIPS pipeline without forwarding discussed in class, and numbering the clock cycle at which the first of the instructions is fetched as clock cycle 1. Assume that if one instruction reads a register during the same clock cycle as another instruction is writing it, the new value will be read. Do not reorder the instructions. Instructions are fetched

and executed exactly in the order given below, with the pipeline stalling if necessary.

```
addi $s2, $s2, 1
li $s6, 5
add $s1, $s2, $s3
move $s5, $s6
lw $t1, 0($s5)
```

4. (4 marks) Repeat the above question, but now assume that the pipeline does use forwarding. Provide a drawing.

Coding Section

Milestone 3 (12 marks)

Remember to comment your code and add student information and name at the top

Using your first assignment code convert the following label sections to functions:

Please note: assume the user will input the correct operations and numbers you do not need to consider incorrect input.

Continuing from Assignment 2 coding program, now add the following procedures:

- Multiplication: using the various mul instructions to add multiplication into the list operation. Like add and subtract needs to be passed an array.
- Division: Same idea as multiplication except use div instruction. Make sure to keep track of HI and LO registers for rounding/reminders

With the addition of multiplication and division, your calculator now needs to take floating point. You can specify a mode for the user to decide or add it in as general feature to the calculator. Again your prompt needs to make sense for what the markers can test and how to operate the calculator.

Assume now your calculator can take 10 operands between +, -, x, /, and if you did ^. Again, main needs to call multiplication and division and readin needs to be able to accept floating point integers. Negative number are still not a requirement.