

Computer Architecture 1 Final Exam

ELE319, Hanyang University, 2019 Spring.
ID: _____ Name: _____

Department: _____

The first two problems are mandatory. If you fail to answer the questions, you will not receive any credit.

- (5pt) Specify the 5-stage pipeline and explain what operation is performed at each stage.
- (5pt) Specify three hazards in processor pipelining and explain hardware and software approaches to solve the hazards.
- (5pt) Write the output value (C) for the given circuits if $A=1$ and $B=1$.



- (5pt) We construct a 2-bit multiplier using Mux as following. Two inputs are provided to a selector in Mux. For instance, $01 * 01 = 0001$ and $00 * 00 = 0000$ in the following figure. Fill the remained constant input values in the Mux to complete the multiplier. (1.5pt)



- (5pt) Similarly, we are constructing a divider using a ROM as following. In the example, if dividend is 5 and divisor is 2 then quotient is 2 and remainder is 1. Hence, $0x21$ is stored at address $0x52$. What value should be stored at address $0x53$ in the ROM to support the divider? (1.5pt)



- (5pt) What is the difference between latch and flip-flop? (5pt)
- (5pt) For the following arithmetic unit, we want to compute $A-B$ where 2's complement number is used. Determine proper values for $S1, S0, C_{in}$ to make $F = A-B$.



- (24pt) The following figure shows single cycle implementation for datapath and control path for MIPS architecture.



Fill 0, 1 or X(don't care) in the following table to implement for the architecture.

Instruction	ALU Op	MEMRs of Reg	Reg Write	Mem Read	Mem Write	Branch
R-type instruction	(1)	(2)	(3)	(4)	(5)	(6)
Load	(7)	(8)	(9)	(10)	(11)	(12)
Store	(13)	(14)	(15)	(16)	(17)	(18)
branch	(19)	(20)	(21)	(22)	(23)	(24)

Computer Architecture Final Exam Solutions

Rachel Sandford



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