CS-2110 Quiz 4A

Alan Chiang

TOTAL POINTS

64 / 100

QUESTION 1

1 K-Map 1 6 / 10

+ 0 Graded. No double jeopardy. If they have a correct boolean based on an incorrect grouping, give credit for boolean.

+ 4 2 by 2 wrapping the two ones on the leftmost column with the 2 x's on the rightmost column

+ 4 1 by 4 group on rightmost column.

+ 2 Boolean reflects groupings

- 3 Includes extra groupings in addition to correct groupings

QUESTION 2

2 K-Map 2 7 / 10

+ 0 Graded. No double jeopardy. If they have a correct boolean based on an incorrect grouping, give credit for boolean.

+ 3 2 by 2 wrapping top two x's with bottom 1 and x

+ 3 1 by 4 on second column from the left

+ 3 2 by 1 grouping two 1's on second and third column.

+ 1 AD + C'D + A'BC' or boolean reflects grouping

- 3 Includes extra groupings in addition to the correct groupings

QUESTION 3

3 Assembling 20 / 40

+ 0 Graded. No credit if value is left in binary.

+ 10 a) xA004

+ 10 b) x1039

+ 10 c) x0DFE

+ 10 d) x3002

QUESTION 4

4 Datapath ADD 5 / 10

+ 0 Graded

+ 2.5 SR2MUX = SR2

+ 2.5 GATEALU

+ 2.5 LDREG

+ 2.5 LDCC

QUESTION 5

5 Datapath LDR 6 / 10

+ 0 Graded. Give points if equivalent MUX select codes were given.

+ 2 ADDR1_MUX = SR1

+ 2 MARMUX = ADDR

+ 2 LDMDR

+ 2 GATEMDR

+ 2 LDCC

QUESTION 6

6 Short Answer 1 10 / 10

+ 0 Graded

+ 5 LD calculates the address based on the current PC value plus a specified offset.

+ 5 LDR calculates the address by adding a base address stored in a register to a specified offset.

- 2 Doesn't correctly mention how LD value address is calculated; PC + offset

QUESTION 7

7 Short Answer 2 10 / 10

+ 0 Graded

+ 5 The CC register contains whether the previous operation produced a negative, zero, or positive value and is used for BR instructions

+ 5 The CC is set whenever a value is loaded into one of the registers in the register file.

CS-2110 Fall 2016 Quiz 04a

Name: Alan Chiang Section: 3:00 Klaus

K-Maps: (___ / 20)

Circle the groups on the following K-Maps that would result in the most optimal simplification and write out the resulting boolean logic statement.

	CD	C'D	C'D'	CD'
AB	0	0	0	1
A'B	1	0	x	x
A'B'	1	0	x	x
AB'	0	0	0	1

Expression: CDA' + CD'

	CD	C'D	C'D'	CD'
AB	x	x	0	0
A'B	0	1	1	0
A'B'	0	1	0	0
AB'	1	x	0	x

Expression: C'D + AB'D + A'BC'

Assembling: (___ / 40)

Assemble the following instructions. Express all of your answers in **16 bits** using **HEX**

Address	Label	Instruction	HEX
0x3000		LDI R0, num	0xA004
0x3001	LOOP	ADD R0, R0, -7	0x1037
0x3002		BRnz LOOP	0x0DFF
0x3003		ST R0, ans	0x3002
0x3004		HALT	0xF025
0x3005	num	.fill x4321	0x4321
0x3006	ans	.fill 0x0	0x0000
...	...	...	...
0x4321		.fill x42	0x0042

1010|0000|0000|0100

0001|0000|0011|0111

0000|1101|1111|1111

0011|0000|0000|0010

CS-2110 Fall 2016 Quiz 04a

Name: Alan Chiang Section: 3:00 Klaus

Datapath Signals: (____ / 20)

Fill in the missing signals during each clock cycle for the following instructions

ADD R3, R2, R1

CC1: SR2MUX= SR2OUT, ALUK= ADD, gateALU, gateMDR, MEM.EN,WE, SR1=R1, SR2=R2, DR=R3

LDR R2, R1, offset

CC1: SR1=R1, ADDR1_MUX= SR.1OUT, ADDR2_MUX= SEXT[0:5], MARMUX= ADD, gateMARMUX, LDMAR

CC2: MEM_EN, MDR.SRC.MUX=MEM, LD.MDR

CC3: 1, LD.REG, LD.MAR, DR=R2

Short answer: (____ / 20)

1) Explain the difference in addressing between the **LD** instruction and the **LDR** instruction.

LD loads the contents of the memory address (PC + offset) into the DR, so is limited by the range of 2's complement numbers in 9 bits; anything stored in an address outside the range of PC ± 9 bits cannot be loaded using LD

LDR finds the contents of memory using the address of the base register input, which is then offset by 6. It can load contents outside the reach of LD by jumping to a nearby base register.

2) What is the function of the **CC** register in the LC-3 datapath? When is the value of the CC set?

Condition code, it holds the sign of the last operation (NZP) that modified a register

set by ops (AND, ADD) that modify registers