#### Nolan Anderson

## CPE221

#### Final Exam

- **1.** True
- **2.** MIPS
- **3.** Embedded
- **4.** True
- 5. Scope
- **6**. r2 = -240 = **1111 0001**
- **7.** -145 = 1111 1111 0110 1111
  - +379 = <u>0000 0001 0111 1011</u>

## = 1111 1110 0001 0100

8. r2 = 0000 0100 0110 1000 0011 0001 1110 0110

<u>r3 = 0101 1001 0011 0010 1100 1101 0000 0111</u>

r2 = **1110 0000 1011 0011 0100 1100 1001 1010** 

## 9.

Cycle	Concrete RTL	Signals
1	MAR <- R1	E <sub>IR_B</sub> = 1, M_ALU = 1, C MAR
2	MBR <- MAR	M_MBR, C <sub>MBR</sub> , READ = 1
3	R1 <- MBR	E <sub>MBR</sub> = 1, M_ALU, C <sub>r1</sub>
4	MAR <- r0	$E_{R0_B} = 1$ , $M_ALU = 1$ , $C_{MAR}$
5	MBR <- MAR	M_MBR, C <sub>MBR</sub> , Read = 1
6	MBR < MBR + r1	ALU(F1, F2) = 1, 0, E <sub>MBR_B</sub> = 1, M_MBR = 1, C <sub>MBR</sub>
7	MAR <- IR	$E_{IR_B}$ , $M_ALU = 1$ , $C_{MAR}$
8	M[MAR] <- MBR	Write
9		

# 10.

Address		Hit / Miss	
0xFFa	1111 1111 1010	Miss	
0x010	0000 0001 0000	Miss	
0xFE8	1111 1110 1000	Hit	
0x497	0100 1001 0111	Miss	
0x 8E5	1000 1110 0101	Miss	
0x483	0100 1000 0011	Hit	
0x392	0011 1001 0010	Miss	
0x027	0000 0010 0111	Miss	
0x135	0001 0011 0101	Miss	
0x592	0101 1001 0010	Miss	

Index = log28 = 3 bits, block = log28 = 3 bits

Byte = 2 bits Tag = 12-(3+3+2) = 4 bits

Set	Tag	data
0	0000	M[000-01F]
1	0000 0001	M[020-03f], m[120-13f]
2		
3		
4	0100, 0101, 0011	M[480-49F], M[580-59F], M[380-39F]
5		
6		
7	1111, 1000	M[Fe0-FFF], M[8E0-8FF]

## 11.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
STR R2, [r4]	IF	R	E	MR	MW	W										
ADD r6, r2, r5		IF	R	Ε	MR	MW	W									
LDR r7. [r3]			IF	R	E	MR	MW	W								
MOV r9, r6				IF	R	R	R	R	Е	MR	MW	W				
EOR r7, r7, r6					IF	IF	IF	IF	R	E	MR	MW	W			

13 cycles

## AREA PROB\_12, CODE, READONLY

**ENTRY** 

LDR r3, size

LDR r4, i

loop CMP r4, r3 ; for(I = 0; I < 10; i++)

BGE done ; if i is greater than 10, exit loop

ADD r5, r4, #1 ; j = i + 1

loop2 CMP r5, r3 ; for(j = i+1; j < 10; j++)

BGE done2; if j is greater than 10, exit loop

LDR r6, [r5, LSL #2]; r6 <- x[j]

LDR r7, [r4, LSL #2] ; r7 <- x[i]

CMP r6, r7 ; if(x[j] < x[i])

BGE done ; if x[j] is greater than x[i] then end

LDR r8, r7; temp <- x [i]

LDR r7, r6 ;  $x[i] \leftarrow x[j]$ 

LDR r6, r8 ;  $x[j] \leftarrow temp$ 

ADD r4, r4, #1 ; i++

ADD r5, r5, #1 ; j++

B loop2

done2 B loop

done B done

X DCD 400, 2, -3, 285, 47, 11, -13, 17, 19, -95

temp SPACE 4

i DCD 0

size DCD 10

**END** 

#13 I highlighted sp in blue, and fp in green.

CPE 22.1	Final Exam	Spring 2020
FP 1		
Address Value	Address Value	Address Value
FFFF FFD8	FFFF FFD8	FFFF FFD8
FFFF FFDC	FFFF FFDC	FFFF FFDC
FFFF FFEO	FFFF FFEO	FFFF FFEO
FFFF FFE4	FFFF FFE4	FFFF FFE4
FFFF FFE8	FFFF FFE8	FFFF FFE8
FFFF FFEC	FFFF FFEC	FFFF FFFC
FFFF FFF0 FFFF FFF4	FFFF FFF0 FFFF FFF4	FFFF FFF4
FFFF FFF8	FFFF FFF8	FFFF FFF8
FFFF FFFC	FFFF FFFC	FP FFFF FFFC
Instruction:	Instruction:	Instruction:
	50b fp. 5p. #4	Sub sp. sp. #16
mov 50 \$0x0000000	200 +p, 3p, 44	300 37, 39, 410
Address Value	Address Value	Address Value
FFFF FFD8	FFFF FFD8	FFFF FFD8
FFFF FFDC	FFFF FFDC	FFFF FFDC
FFFF FFEO	FFFF FFEO	FFFF FFEO
FFFF FFE4	FFFF FFE4	FFFF FFE4
FFFF FFE8		
	FFFF FFE8	FFFF FFE8
FFFF FFEC	FFFF FFEC	FFFF FFEC LI LI
FFFF FFFO	FFFF FFFO L	FFFF FFFO 4
FFFF FFF4 3	FFFF FFF4 3	FFFF FFF4 3
FFFF FFF8	FFFF FFF8	FFFF FFF8
FFFF FFFC	FFFF FFFC	FFFF FFFC
Instruction:	Instruction:	Instruction:
Str 13, [fp, #-8]	Str & 3, [ FP, H-12]	War I Carl Ha
		push Elr3
Address Value	Address Value	Address Value
FFFF FFD8	FFFF FFD8	FFFF FFD8
FFFF FFDC	FFFF FFDC	FFFF FFDC
FFFF FFEO	FFFF FFEO	
FFFF FFE4		FFFF FFE0
		THE TIES
FFFF FFE8   FFFF FFF C	FFFF FFE8 FFFF FFFC	FFFF FFE8 FFFF FFFC
EFFECT YL)	FFFF FFEC MA	FP FFFF FFEC 44
FFFF FFFO 4	FFFF FFFO 4	FFFF FFFO 4
FFFF FFF4 3	FFFF FFF4 2	FFFF FFF4 3
FFFF FFF8	FFFF FFF8	
		FFFF FFF8
FFFF FFFC	FFFF FFFC	ESSE SEEC
Instruction:	Instruction:	Instruction:
add specification		PUSH SEPTEMBER
	*	
The second secon		
The second second second		1-
	push { (43	Add FP, SP, #8
push {fe}	Posa [17]	1700 117 17
P		
The second second second		Page 8 of 9
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STATE OF THE PARTY		

Address	Value
FFFF FFD8	
FFFF FFDC	The same of the sa
FFFF FFEO	
FFFF FFE4	42
FFFF FFE8	PFFF FFFC
FFFF FFEC	44
FFFF FFF0	4
FFFF FFF4	3
FFFF FFF8	
FFFF FFFC	

Instruction:

PURETY?

506 SP,	50, #8
Address	Value
FFFF FFD8	
FFFF FFDC	내
FFFF FFEO	3
FFFF FFE4	47
FFFF FFE8	CFFF FFFL
FFFF FFEC	44
FFFF FFFO	N
FFFF FFF4	3
FFFF FFF8	
FFFF FFFC	

Instruction:

Experience of the same

SUB SP,	Eb # 18
Address	Value
FFFF FFD8	
FFFF FFDC	ч
FFFF FFEO	3
FFFF FFE4	9
FFFF FFE8	Ettt been
FFFF FFEC	44
FFFF FFFO	ч
FFFF FFF4	3
FFFF FFF8	
FFFF FFFC	

Instruction:

Address	Value
FFFF FFD8	
FFFF FFDC	
FFFF FFEO	3
FFFF FFE4	42
FFFF FFE8	EE EE EEE
FFFF FFEC	LIM
FFFF FFFO	ч
FFFF FFF4	3
FFFF FFF8	
FFFF FFFC	

Instruction:

Str ro.	1 FP, #-125
Address	Value
FFFF FFD8	
FFFF FFDC	4
FFFF FFEO	3
FFFF FFE4	9
FFFF FFE8	FFFF FFF
FFFF FFEC	E 14
FFFF FFFO	49
FFFF FFF4	3
FFFF FFF8	
FFFF FFFC	

Instruction:

WHI, HI, TIE	
POP 5	143
Address	Value
FFFF FFD8	

FFFF FFDC	4
FFFF FFEO	3
FFFF FFE4	9
FFFF FFE8	FFF FFL
FFFF FFEC	Nel .
FFFF FFF0	4
FFFF FFF4	3
FFFF FFF8	
FFFF FFFC	16

Instruction:

Str 10, Efp. H-43

Address	Value
FFFF FFD8	
FFFF FFDC	4
FFFF FFEO	3
FFFF FFE4	42
FFFF FFE8	ECELLEC
FFFF FFEC	44
FFFF FFFO	4
FFFF FFF4	3
FFFF FFF8	
FFFF FFFC	

Instruction:

SUB SP, SP, # 8	
Str r1, & Fp, #-163	
Address	Value
FFFF FFD8	
FFFF FFDC	ч
FFFF FFEO	3
FFFF FFE4	9
FFFF FFE8	FELLER
FFFF FFEC	ич
FFFF FFFO	ч
FFFF FFF4	3
FFFF FFF8	
FFFF FFFC	

Instruction:

Address	Value
FFFF FFD8	
FFFF FFDC	4
FFFF FFEO	3
FFFF FFE4	9
FFFF FFE8	FFFF FFFL
FFFF FFEC	44
FFFF FFF0	4
FFFF FFF4	3
FFFF FFF8	
FFFF FFFC	16
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Instruction:

add sp, fe, 74